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Contingent Fees and Tax Compliance

John Phillips

University of Iowa

Richard C. Sansing

Yale University

ABSTRACT: This paper examines the effects of banning contingent fees for tax return preparation services. The paper presents a principal-agent model in which a taxpayer contracts with a tax practitioner to attempt to resolve tax law uncertainty. The optimal contract provides incentives for the practitioner to do research and to choose the tax return reporting position that the taxpayer prefers. Analysis of the model shows that banning contingent fees raises the expected fee of the practitioner. The amount of this increase is increasing in the quality of the practitioner. Conventional wisdom holds that contingent fee arrangements will lead to an increase in tax undercompliance. In contrast, we find that undercompliance decreases when contingent fees are allowed.

Key Words: *Contingent fees, Tax compliance, Tax reporting aggressiveness.*

I. INTRODUCTION

THIS paper examines the distributional and tax compliance effects of the ban on the use of contingent fees for tax return preparation services. Rule 302 of the American Institute of Certified Public Accountants Code of Professional Conduct formerly banned contingent fees for all services (AICPA 1978). In 1985, the Federal Trade Commission (FTC) began an investigation of the accounting profession, arguing that certain practices, including the ban on contingent fees, constituted illegal restraints to trade. This investigation culminated in a 1990 settlement in which the FTC allowed the AICPA to issue revised ethics rules prohibiting contingent fees only in engagements involving (1) clients for whom attest services are performed or (2) preparation of an original tax return (FTC 1990).¹

¹ Mason (1994) provides a discussion of the history of the conflict between the AICPA and the FTC. Also, according to Sager (1993), subsequent to the 1990 final agreement between the FTC and the AICPA, the AICPA has lobbied state legislatures to enact legislation prohibiting contingent fees in all situations. Based on information compiled from the CCH *Accountancy Reporter*, the AICPA reports that as of September 3, 1996, 23 of the 54 U.S. states and possessions allow CPAs to charge contingent fees.

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Prior to this 1990 settlement between the FTC and AICPA, however, a 1989 proposed agreement permitted contingent fees for tax return preparation services (FTC 1989). The Internal Revenue Service (IRS), in a letter from Acting Commissioner Murphy, strongly objected to this proposal, warning of the adverse effect it would have on taxpayer compliance and of "the deleterious effect it could have upon the quality of return preparation" (Murphy 1989). In particular, the IRS claimed that "[a] contingent fee structure will encourage tax return preparers to take unsupported positions on the taxpayer's returns." The IRS responded by amending Treasury Circular 230. Section 10.23(b) of Treasury Circular 230 (Department of the Treasury 1994) now prohibits all practitioners from charging "a fee that is based on a percentage of the refund shown on a return or a percentage of taxes saved, or that otherwise depends on the specific result attained." Our research addresses the IRS's claim that contingent fees would lead to increased taxpayer undercompliance.

We address the distributional and tax compliance issues relating to the ban on contingent fees by explicitly modeling the divergence in interests between taxpayers and tax practitioners. We model the tax practitioner as an agent who uses specialized tax knowledge to help taxpayers resolve tax law uncertainty, thereby allowing taxpayers to make more informed reporting decisions and minimize their expected tax costs. Neither the practitioner's research effort nor its outcome, however, are observable and, thus, neither can be used as a contracting variable. In addition, as in Demski and Sappington (1987) and Lambert (1986), the practitioner in our model not only engages in this costly research effort, but also makes the choice of how to use his research findings. Accordingly, the taxpayer must address two issues in writing the contract that properly motivates the practitioner (i.e., mitigates the moral hazard problems that arise when the principal relies on the agent, but cannot monitor his actions). First, the contract must motivate the practitioner's research effort. Second, the contract must induce the practitioner to make the tax return reporting decision that the taxpayer prefers. We first examine the structure of optimal incentive contracts when contingent fees are allowed and then compare these results to those obtained in a setting where contingent fees are banned.

In our model, a tax return reporting position is either favorable or unfavorable to the taxpayer. The favorable (unfavorable) reporting position decreases (increases) the taxpayer's liability shown on the tax return. Similarly, the outcome of an audit of the taxpayer's return is favorable (unfavorable) if the tax authority ultimately accepts (rejects) the favorable reporting position. The practitioner's research effort may or may not eliminate tax law ambiguity. When the tax law remains ambiguous, aggressive taxpayers prefer the favorable reporting position, whereas conservative taxpayers prefer the unfavorable reporting position. Thus, "conservative" and "aggressive" are *ex ante* labels that characterize a taxpayer's preferred reporting position when the tax law is ambiguous. Tax compliance, however, is an *ex post* (and hypothetical) concept that classifies all tax return reporting positions as either compliant or noncompliant with the tax law, as would ultimately be resolved by the tax authority, regardless of whether noncompliance is detected by an audit. Noncompliance can be either undercompliance or overcompliance, but overcompliance is never detected in our model because returns reflecting unfavorable reporting positions are not audited.

We first show that if the taxpayer is aggressive, a contingent fee contract overcomes the moral hazard problems with no loss of efficiency. Therefore, under the contract, practitioners do not earn economic rents from their aggressive clients. When the taxpayer is conservative, a contingent fee contract is still optimal. The average contingent fee, however, exceeds the opportunity cost of the practitioner's time, allowing the practitioner to receive rents from the conservative taxpayer.

As discussed above, practitioners in the U.S. are prohibited from charging fees contingent on the reporting position taken in the tax return. When we constrain the taxpayer and

the practitioner to a fixed-fee arrangement, the optimal contract increases the expected fee and thereby enables the practitioner to earn economic rents from both aggressive and conservative taxpayers. In addition, we show that the ban on contingent fees provides the greatest benefit to the highest quality practitioners.

While these distributional effects of the ban on contingent fees are straightforward principal-agent model results, the effect of the ban on the aggressiveness of tax return reporting positions is surprising. In particular, although the prohibition against contingent fees results from a concern that such arrangements would cause undercompliance to increase, our analysis shows that the ban on contingent fees has the opposite effect. In the fixed fee setting, taking a favorable reporting position yields a benefit to the practitioner in the form of increased future business. Consequently, practitioners charge aggressive taxpayers a lower fixed fee because such taxpayers prefer that the practitioner choose the favorable position when either the tax law is unambiguously favorable or when the tax law is ambiguous. In contrast, it is more difficult to produce favorable reporting positions for conservative taxpayers because these taxpayers prefer the unfavorable position when the tax law is ambiguous. As a result, banning contingent fees is more costly to conservative taxpayers, which in turn induces some taxpayers, who would have been conservative under a contingent fee regime, to become aggressive under a fixed fee regime. This leads to an increase in the incidence of tax returns displaying favorable tax reporting positions that would ultimately be rejected by the IRS should the return be audited. Thus, our result is inconsistent with the IRS's claim that allowing contingent fees would increase taxpayer undercompliance.

Section II provides a summary of prior research involving the role of tax practitioners on tax reporting behavior. Section III sets forth the details of the model. Sections IV and V present the optimal contract when contingent fees are allowed and banned, respectively. Section VI provides an analysis of the distributional and tax compliance effects of the ban on contingent fees. Section VII presents our conclusions.

II. BACKGROUND AND RELATED LITERATURE

This paper is concerned with the effect of the ban on contingent fees on taxpayer aggressiveness and tax compliance. We focus on ambiguous tax issues rather than cases of taxpayer fraud. The existing tax compliance literature provides no theoretical support for, or against, the IRS's assertion that contingent fees would result in a decrease in tax compliance. Indeed, despite the fact that approximately one-half of all U.S. tax returns are prepared with professional assistance, this literature has largely ignored the role of tax professionals.² Early tax compliance models focused solely on taxpayer behavior and failed to address the strategic roles of both the tax practitioner and tax authority (e.g., Allingham and Sandmo 1972; Yitzhaki 1974; Koskela 1983). While recent research has focused on the game between the taxpayer and the tax authority (e.g., Reinganum and Wilde 1985, 1986; Beck and Jung 1989a, 1989b; Sansing 1993), these models also ignore the role of the tax practitioner. Reinganum and Wilde (1991) incorporate the tax practitioner in their tax compliance model, but do so by modeling the practitioner as a service provider. Their taxpayer knows the tax law but chooses to delegate preparation of the return to the practitioner because the opportunity cost of self-preparing the return is greater than the practitioner's fee.

Contrary to the service-provider role modeled in Reinganum and Wilde (1991), we view the tax practitioner as an expert information provider. Under this view, the practitioner's primary role is to resolve uncertainty concerning the tax treatment of particular items.

² Scotchmer (1989) and Cuccia (1994) discuss previous research on the use of professional preparers.

Beck and Jung (1989a) show that a taxpayer's uncertainty over his or her tax liability leads to the reporting of higher taxable income. Experimental evidence in Beck et al. (1991) supports this theoretical prediction. These results suggest a role for the tax practitioner in resolving uncertainty and thereby minimizing taxable income.

The empirical evidence, however, is inconsistent with the notion that the use of tax practitioners uniformly increases tax compliance. Erard (1993) controls for both selection bias inherent in the use of a tax practitioner and tax return differences and finds that professionally prepared returns show significantly greater undercompliance. Klepper and Nagin (1989) find that the use of practitioners increases compliance with respect to straightforward rules, but decreases compliance with respect to ambiguous areas of the tax law.

Two recent papers address the role of the tax practitioner as an expert information provider. Beck et al. (1996) analyze a model in which the use of a tax practitioner eliminates tax law uncertainty. Melumad et al. (1994) analyze a model in which the use of a practitioner reduces, but does not eliminate, tax law uncertainty. Both papers treat tax practitioners as non-strategic players. In contrast, we view the tax practitioner as not only an expert information provider, but also as a strategic player. Cuccia et al. (1995, 232) summarize the conventional "non-strategic" view of tax practitioners as follows: "Tax preparers generally see their role as that of client advocate, and therefore have an incentive to recommend reporting positions that are more or less aggressive as the client wishes." We do not adopt the assumption implicit in the conventional view that the incentives between taxpayers and practitioners are naturally aligned; instead, we assume the taxpayer and practitioner have different interests, and we identify the optimal way of mitigating these differences. Accordingly, we model the tax practitioner as a self-interested, utility-maximizing agent, as Antle (1982) did in modeling auditor behavior.

While there has been no study addressing contingent fees for tax practitioners, contingent fee contracts for attorneys are shown to be optimal in Dana and Spier (1993) and Rubinfeld and Scotchmer (1993). Fixed fee contracts would not satisfy the incentive compatibility constraints of the models of attorney-client interaction studied in those papers. Such contracts are feasible in our model, however, because the taxpayer-practitioner relationship can be an ongoing one; the practitioner's desire to preserve the relationship for future periods provides incentives to work and act in the taxpayer's interest in the current period.

III. MODEL

A taxpayer (T) delegates to a tax practitioner (P) a tax reporting decision involving D dollars under tax law uncertainty. The practitioner can make an unfavorable or favorable reporting decision. The unfavorable decision yields a payoff to the taxpayer of zero. The consequences of the favorable reporting decision depend on whether the tax return is audited. If either (1) the return is audited and the tax authority's resolution of uncertainty is favorable to T or (2) the tax return is not audited, the payoff to T is $D\pi > 0$. The parameter π represents the potential tax benefit per dollar from choosing the favorable reporting position. If the decision is whether to report gross income or take a deduction, then π equals the taxpayer's marginal tax rate (MTR). If the decision is whether to report income as capital gain or ordinary income, then π equals the excess of the taxpayer's MTR on ordinary income (e.g., 39.6 percent) over the maximum capital gains tax rate of 20 percent. Finally, if the decision is whether to deduct or capitalize an expenditure, then π is $t - (t/m)(1 - [1/(1 + r)^n])$, where t equals the MTR, r equals the discount rate used in evaluating investments, and n equals the number of years over which the expenditure is depreciated or amortized (on a straight-line basis).

If (1) the favorable reporting decision is made, (2) the return is audited, and (3) the tax authority's resolution of uncertainty is unfavorable, then the payoff to T is $-D\lambda < 0$. The parameter λ represents the taxpayer's per dollar disutility from an audit adjustment. It reflects both monetary and nonmonetary factors, such as the present value of underreporting penalties, fear of future audits, and potential reputation effects. We allow λ to vary across taxpayers. Low values of λ are associated with aggressive taxpayers, and high values of λ are associated with conservative taxpayers. The probability of a taxpayer being audited when the favorable reporting position is chosen is equal to α . We assume that $\alpha > \pi/(\pi + \lambda)$. This ensures that the probability of an audit is sufficiently high that the expected payoff from a favorable reporting decision would be negative if the taxpayer knew the outcome of an audit would be unfavorable. The tax authority does not audit the return if the unfavorable position is chosen.

T hires P to do the research and choose the reporting position in exchange for a fee, $y \geq 0$. P can use his tax knowledge to perform the research in an attempt to resolve T's tax law uncertainty. Performing this research permits P to privately observe a signal $\sigma \in \{U, F, N\}$. The signal U means the uncertainty will be resolved unfavorably, the signal F means the uncertainty will be resolved favorably, and the null signal N means the issue remains uncertain. If P does not perform the research, P effectively observes the null signal.

In our setting, T and P are unable to condition the fee on whether the research results are ambiguous. Because we do not allow contracts to depend on the tax authority's ultimate resolution of tax law uncertainty, T cannot induce truthful reporting by P regarding the ambiguity of the tax issue. In addition, assuming that P knows T's preferences, whether T delegates to P the responsibility of implementing the results of the research findings (i.e., prepare the tax return) or T retains the responsibility of doing so has no effect on the structure of the optimal incentive contract between T and P. Because the optimal contract induces P to act in T's interests, having P actually make the reporting decision instead of merely advising T which reporting decision to make is equivalent.

We define P's quality level as the probability that P's research effort will resolve the tax law uncertainty; i.e., higher quality Ps are more knowledgeable and thus better able to resolve uncertainty. The parameter ω , the probability that uncertainty will be resolved, is our measure of P's quality. We assume that the taxpayer can observe the practitioner's quality.³ The probability that the tax treatment will be favorable is 50 percent, and is independent of P's ability to resolve uncertainty. Accordingly, P will privately observe the signals U, F and N with probabilities $\omega/2$, $\omega/2$, and $(1 - \omega)$, respectively. We let FAV denote a favorable audit outcome, i.e., a favorable reporting position with which the tax authority agrees, given it audits the return. The signals U, F and N, together with the 50 percent prior probability that the treatment will be favorable, imply the following posterior probabilities: $\Pr(\text{FAV}|F) = 1$, $\Pr(\text{FAV}|U) = 0$, and $\Pr(\text{FAV}|N) = 1/2$.

If P does the research, he incurs an unobservable personal cost $c(\omega) \geq 0$. This cost represents the practitioner's opportunity cost of time rather than his disutility for effort. We assume that $c(0) = 0$, $c'(\omega) > 0$, and $c''(\omega) > 0$, which implies that $c(\omega) > 0$ for all $\omega > 0$. Finally, we constrain ω to be greater than or equal to θ , so θ defines the lowest quality practitioner.

We assume that both T and P are risk-neutral for three reasons. First, it is not apparent that either party has a comparative advantage in bearing risk. Second, adding risk considerations is not necessary to capture the economic forces that we believe are at the heart of

³ The assumption that quality can be observed is justified on the grounds that brand name (e.g., CPA vs. non-CPA, Big 6 vs. local firm) is considered a credible signal of practitioner quality.

the relationship between the taxpayer and the tax practitioner and would only generate second-order effects that would potentially detract from the insights we strive to generate. Third, the conventional solution of making the agent the residual claimant in the absence of risk-sharing considerations is not feasible here because the taxpayer's liability under the tax laws cannot be assigned to the practitioner.

The expected cost of hiring P depends on the reporting position T prefers when P fails to resolve tax law uncertainty (i.e., when P observes the null signal N). Table 1 shows the taxpayer's preferred reporting position as a function of taxpayer type, the signal observed by the practitioner, and the ultimate resolution of tax law uncertainty.

The patterns in table 1 are consistent with the findings of Klepper and Nagin (1989). Use of the tax practitioner ensures that noncompliance in unambiguous areas of the tax law does not occur. When the law is ambiguous, however, noncompliance will be observed despite the use of the practitioner.

The fee paid to the practitioner is allowed to vary with the taxpayer's type. In addition, T and P can agree to a fee that is contingent on the reporting position P chooses. The fee paid to P can thus be expressed as y_{ij} , where $i \in (A, C)$ refers to aggressive and conservative taxpayers, respectively, and $j \in (U, F)$ refers to the reporting positions that are unfavorable and favorable to the taxpayer, respectively. Table 2 presents a summary of the possible fees paid to the practitioner.

If T is aggressive, the expected payoff from hiring P is:

$$\frac{D\omega\pi}{2} + (1 - \omega) \left[D\pi \left(1 - \frac{\alpha}{2} \right) - \frac{D\lambda\alpha}{2} \right] - E[y_A], \quad (1)$$

where $E[y_A]$ refers to the expected fee paid by an aggressive taxpayer. If T is a conservative taxpayer, the expected payoff from hiring P is:

$$\frac{D\omega\pi}{2} - E[y_C], \quad (2)$$

where $E[y_C]$ refers to the expected fee paid by a conservative taxpayer. Figure 1 provides a timeline of the key events relevant to the taxpayer-practitioner relationship.

TABLE 1
Effect of Using a Practitioner on Tax Compliance

<i>Signal Received by Practitioner</i>	<i>Actual Resolution of Tax Law Uncertainty</i>	<i>Reporting Position of Conservative Taxpayer</i>	<i>Reporting Position of Aggressive Taxpayer</i>
Favorable	Favorable	Favorable	Favorable
Null	Favorable	Unfavorable ^a	Favorable
Null	Unfavorable	Unfavorable	Favorable ^b
Unfavorable	Unfavorable	Unfavorable	Unfavorable

^a Denotes the existence of tax positions unfavorable to the taxpayer that would be reversed upon an audit by the tax authority (overcompliance).

^b Denotes the existence of tax positions favorable to the taxpayer that would not be sustained upon an audit by the tax authority (undercompliance).

TABLE 2
Payments from the Taxpayer to the Practitioner
Based on Taxpayer Type and Signal Received

<i>Signal Received^a</i>	<i>Taxpayer Type</i>	
	<i>Aggressive^b</i>	<i>Conservative^c</i>
Favorable	y_{AF}	y_{CF}
Unfavorable	y_{AU}	y_{CU}
Null	y_{AF}	y_{CU}

^a P uses his tax expertise to perform the research necessary to resolve T's tax law uncertainty. Performing this research permits P to privately observe a signal. The favorable signal means the uncertainty will be resolved favorably, the unfavorable signal means the uncertainty will be resolved unfavorably, and the null signal means the issue is ambiguous. The payments reflected in this table assume the practitioner takes the taxpayer's preferred reporting position based on the signal received.

^b The aggressive taxpayer prefers the favorable reporting position when the practitioner observes either the favorable or the null signal.

^c The conservative taxpayer prefers the favorable reporting position only when the favorable signal is observed.

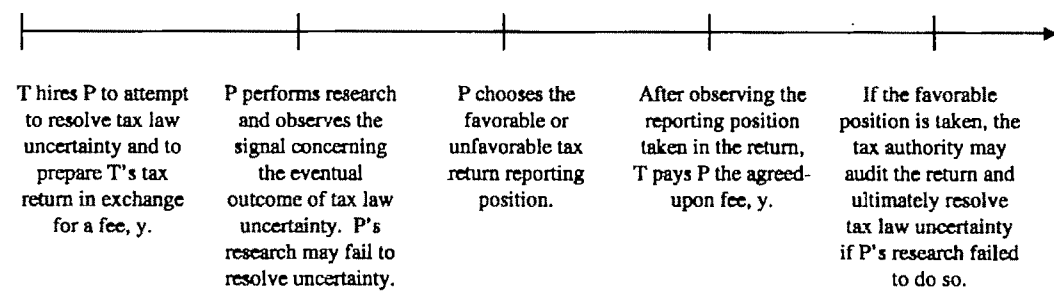
As a benchmark, we consider the first-best case. Here, T pays P his reservation price of $c(\omega)$, P does the research, and P chooses the reporting position T prefers based on P's research finding. Comparing equations (1) and (2) indicates that in the first-best case, if P fails to resolve tax law uncertainty, T is indifferent between the unfavorable and favorable reporting decisions when:

$$\lambda = \frac{\pi(2 - \alpha)}{\alpha}. \quad (3)$$

We henceforth denote this indifference point as λ_{FB}^* , where FB denotes first-best. Taxpayers with λ values lower than λ_{FB}^* are aggressive, while taxpayers with λ values higher than λ_{FB}^* are conservative. Note that λ_{FB}^* is independent of the amount of the dollars involved in the tax law uncertainty.

When the first-best outcome cannot be obtained and the null signal is observed, T is indifferent between favorable and unfavorable reporting positions only when the expected

FIGURE 1
Timeline of Key Events



payoffs from these alternative choices are equal. Setting equations (1) and (2) equal to each other results in a cutoff value of λ :

$$\lambda^* = \lambda_{FB}^* + \frac{2(E[y_C] - E[y_A])}{D(1 - \omega)\alpha}. \quad (4)$$

Equation (4) indicates that when the first-best outcome cannot be obtained, the cutoff value λ^* depends on the difference in the expected practitioner fees associated with the aggressive and conservative taxpayers. This expression also indicates that the effect of the moral hazard problem on taxpayer aggressiveness dissipates as the dollar amount of the tax issue increases. This makes sense because the higher the amount at stake, the less impact this difference in expected fees should have on whether the taxpayer is aggressive or conservative.

Next, we consider the incentives facing the practitioner. We consider four factors that determine P's payoff. First, as noted above, we allow the fee that T pays P to be contingent on the reporting position taken in the return. We deliberately restrict our attention to contracts that depend only on the reporting position taken in the return and not on the ultimate resolution of uncertainty.⁴ We denote the value of being hired by an aggressive taxpayer as V_A , where value means the difference between P's expected fee and the opportunity cost of P's time. Given P works and reports in accordance with T's wishes:

$$V_A = \left(1 - \frac{\omega}{2}\right)y_{AF} + \frac{\omega y_{AU}}{2} - c(\omega). \quad (5a)$$

Similarly, the value of being hired by a conservative client, V_C , is:

$$V_C = \frac{\omega y_{CF}}{2} + \left(1 - \frac{\omega}{2}\right)y_{CU} - c(\omega). \quad (5b)$$

Second, as discussed above, we recognize that the relationship between P and T is usually an ongoing one and, hence, P prefers to minimize T's tax liability so as to increase the chances P will be hired in the future, either by T or other taxpayers familiar with T's outcome. We therefore assume that the selection of the favorable reporting position increases the demand for P's services in subsequent periods. The value to P of this increase is γV_A when the taxpayer is aggressive and γV_C when the taxpayer is conservative. These future considerations alone align the incentives of P and T when contingent fee contracts are banned.

Third, we assume P pays an exogenously determined penalty x if he takes a favorable reporting position, the return is audited, and the signal U would have been observed by the lowest quality practitioner. This penalty is thus imposed if either (1) P performed the research, observed the U signal, and chose the favorable reporting position or (2) P shirked, chose the favorable reporting position, and the legal authority for the position is so weak

⁴ We do not, for example, allow side bets between P and T regarding the ultimate resolution of the tax law uncertainty. We believe that such side bets would provide T with an economic incentive to withhold pertinent facts from P. For example, suppose T sells a capital asset for a loss prior to year end and re-acquires this asset within 30 days. The tax law refers to this as a "wash sale" and disallows the loss on the sale. T has an incentive to withhold the information concerning this subsequent acquisition from P. Suppose this induces P to claim the deduction. If the return is not audited by the tax authority, T is better off not communicating this information to P because of the tax savings attributable to the noncompliant reporting position. Alternatively, if the return is audited, T is still better off by virtue of winning the side bet from P.

that the tax authority can infer that the U signal would have been observed by even a minimally competent preparer. Throughout, we assume x is sufficiently large to deter P from taking the favorable reporting position unless either F or N is observed. The effect of this assumption is that it deters P from not doing research and taking a favorable reporting position. We interpret x as including practitioner penalties imposed by the IRS, damages paid to the taxpayer in malpractice litigation following the unfavorable audit outcome, revocation of the license to practice by the state board of public accountancy, and/or any other financial consequences, such as those resulting from the loss of clients, due to publicity regarding P's behavior.

Fourth, a conservative taxpayer cannot suffer a loss of $-D\lambda$ unless the practitioner acts contrary to the taxpayer's wishes by choosing the favorable reporting position after observing the null signal. While this action is insufficient to result in the penalty x as defined above, we assume that an unfavorable audit outcome for a conservative taxpayer decreases the demand for the practitioner's services in subsequent periods, costing the practitioner βV_C . We assume $\gamma < \alpha\beta/2$, which implies that when the tax law is ambiguous, the expected future cost of taking the favorable reporting position for a conservative client exceeds the future benefit received from minimizing that client's current period tax liability. As a consequence, when T is conservative and the fee is not contingent on the outcome (i.e., $y_{CF} = y_{CU}$), P prefers to take the unfavorable position after observing the null signal. An unfavorable audit outcome does not reduce the demand for P's services by aggressive taxpayers, however, because the practitioner acts in accordance with the aggressive taxpayer's wishes when he chooses the favorable position after observing the null signal. Accordingly, this potential decrease in future business occurs only when the practitioner is hired by the conservative taxpayer.

IV. OPTIMAL CONTINGENT FEE CONTRACT

In this section, we characterize the contract that induces P to do the research and make the reporting decision that T prefers. We allow P and T to enter into a contingent fee arrangement.

The program to solve for the optimal contract for the aggressive taxpayer is shown below.

$$\min_{y_{AF}, y_{AU}} \left(1 - \frac{\omega}{2}\right)y_{AF} + \frac{\omega y_{AU}}{2}$$

subject to:

$$\left(1 - \frac{\omega}{2}\right)(y_{AF} + \gamma V_A) + \frac{\omega y_{AU}}{2} \geq c(\omega); \quad (IR)$$

$$\left(1 - \frac{\omega}{2}\right)(y_{AF} + \gamma V_A) + \frac{\omega y_{AU}}{2} - c(\omega) \geq y_{AF} + \left(1 - \frac{\alpha}{2}\right)\gamma V_A - \frac{\theta\alpha x}{2}; \quad (IA1)$$

$$\left(1 - \frac{\omega}{2}\right)(y_{AF} + \gamma V_A) + \frac{\omega y_{AU}}{2} - c(\omega) \geq y_{AU}; \quad (IA2)$$

$$y_{AF} + \gamma V_A \geq y_{AU}; \quad (AS1)$$

$$y_{AU} \geq y_{AF} + (1 - \alpha)\gamma V_A - \frac{\theta\alpha x}{2}; \quad (AS2)$$

$$y_{AF} + \left(1 - \frac{\alpha}{2}\right)\gamma V_A \geq y_{AU}. \quad (AS3)$$

T's objective is to minimize the expected payment to P, given that P is induced to do the costly research and report in accordance with T's wishes. The individual rationality (IR) constraint ensures that the expected benefit to P when he works and chooses the favorable position (unless U is observed) is at least as great as the opportunity cost of P's time. The two information acquisition (IA) constraints ensure that P's expected payoff from working and reporting favorably (unless U is observed) exceeds the expected payoff from either not working and reporting favorably (IA1) or not working and reporting unfavorably (IA2). Finally, the three act-selection (AS) constraints ensure that P chooses the favorable position when the signal F is observed (AS1), chooses the unfavorable position when the signal U is observed (AS2), and chooses the favorable position when the signal N is observed (AS3), i.e., when the tax law remains uncertain after the research is completed.

Proposition one characterizes the optimal contingent fee contract between the aggressive taxpayer and the tax practitioner.

Proposition 1: The first-best outcome is achieved by a contingent fee contract in which:

- (a) $y_{AU}^* = 0$;
- (b) $y_{AF}^* = \frac{2c(\omega)}{2 - \omega}$;
- (c) $E[y_A] = c(\omega)$;
- (d) $V_A = 0$.

Proposition one shows that if the practitioner and an aggressive taxpayer can enter into a contingent fee contract, P can be induced to work and take the action T prefers with no loss of efficiency. The intuition behind this result becomes clear when the (IA2) and (AS3) constraints are examined more closely. The (IA2) constraint, which deters P from shirking and choosing the unfavorable reporting position, can be rewritten as:

$$\left(1 - \frac{\omega}{2}\right)(y_{AF} - y_{AU} + \gamma V_A) \geq c(\omega). \quad (6)$$

Equation (6) indicates that P can be motivated to perform the research by (a) making the gap between y_{AF} and y_{AU} sufficiently large and/or (b) increasing the value of the aggressive taxpayer's future business.

Next, the constraint that motivates P to report aggressively when the null signal is observed, (AS3), can be rewritten as:

$$y_{AF} - y_{AU} \geq \gamma V_A \left(\frac{\alpha - 2}{2}\right). \quad (7)$$

Equation (7) reveals that there is no conflict of interest between the aggressive T and P when the null signal is received because there is no limit on the gap between the two fees; thus, the value of future business is not necessary to motivate P. Accordingly, the aggressive T will choose to motivate P in the cheapest possible manner by paying an expected fee equal to P's opportunity cost of time, nothing if the unfavorable position is taken, and a positive fee only if P chooses the favorable position. To summarize, when contingent fees are allowed, the current fees provide all the incentives necessary to induce the practitioner to do the research and report in the aggressive T's interests.

Now suppose T wants to induce P to choose the unfavorable reporting position if the null signal is observed. The solution to the following program characterizes the optimal contract for the conservative taxpayer.

$$\min_{y_{CF}, y_{CU}} \frac{\omega y_{CF}}{2} + \left(1 - \frac{\omega}{2}\right) y_{CU}$$

subject to:

$$\frac{\omega(y_{CF} + \gamma V_C)}{2} + \left(1 - \frac{\omega}{2}\right) y_{CU} \geq c(\omega); \quad (IR)$$

$$\frac{\omega(y_{CF} + \gamma V_C)}{2} + \left(1 - \frac{\omega}{2}\right) y_{CU} - c(\omega) \geq y_{CF} + \left(1 - \frac{\alpha}{2}\right) \gamma V_C - \frac{\theta \alpha x}{2}; \quad (IA1)$$

$$\frac{\omega(y_{CF} + \gamma V_C)}{2} + \left(1 - \frac{\omega}{2}\right) y_{CU} - c(\omega) \geq y_{CU}; \quad (IA2)$$

$$y_{CF} + \gamma V_C \geq y_{CU}; \quad (AS1)$$

$$y_{CU} \geq y_{CF} + \left(1 - \frac{\alpha}{2}\right) \gamma V_C - \frac{\theta \alpha x}{2}; \quad (AS2)$$

$$y_{CU} \geq y_{CF} + \left(1 - \frac{\alpha}{2}\right) \gamma V_C - \frac{\alpha \beta V_C}{2}. \quad (AS3)$$

The major difference between the first and second optimization problems is that in the second problem, the (AS3) constraint must induce P to choose the unfavorable reporting position if the null signal is observed. The solution is characterized in proposition two.

Proposition 2: In the optimal contingent fee contract for the conservative taxpayer:

$$\begin{aligned} (a) \quad y_{CF}^* &= \frac{2c(\omega)}{\omega} + \frac{2c(\omega)(2 - 2\gamma + \gamma\omega)}{\alpha(\beta + \gamma)\omega}; \\ (b) \quad y_{CU}^* &= \frac{2c(\omega)(2 + \gamma\omega)}{\alpha(\beta + \gamma)\omega}; \\ (c) \quad E[y_C] &= c(\omega) \left[1 + \frac{4}{\alpha(\beta + \gamma)\omega} \right]; \\ (d) \quad V_C &= \frac{4c(\omega)}{\alpha(\beta + \gamma)\omega}. \end{aligned}$$

Proposition two indicates that it is more costly to motivate P when the taxpayer is conservative. The solution to the first optimization problem does not solve the second because the AS3 constraint would be violated; this causes y_{CU}^* to be positive in proposition two. Paying P a constant fee of $c(\omega)$ would also be inadequate because P would not have any incentive to do the research.

A closer examination of the (IA2) and (AS3) constraints again helps explain the intuition behind these results. First, recharacterizing the (IA2) constraint as:

$$\frac{\omega}{2} (y_{CF} - y_{CU} + \gamma V_C) \geq c(\omega) \quad (8)$$

again reveals that the difference between the two fees and/or the value of T's future business can motivate P to perform the research. Unlike the case of the aggressive taxpayer, however, reformulation of the (AS3) constraint as:

$$V_C \left[\frac{\alpha \beta}{2} + \gamma \left(\frac{\alpha - 2}{2} \right) \right] \geq y_{CF} - y_{CU} \quad (9)$$

reveals that the conservative T has limited ability to motivate P to work by increasing the difference in the fees. This results from the tension that T faces between (a) motivating P to work and choose the favorable position if the F signal is observed and (b) wanting P to choose the unfavorable reporting position if the N signal is observed. Accordingly, the conservative T is forced to use both the difference in current fees and the value of future business to motivate P. Because T's future business is valuable only when P is paid an expected fee greater than his opportunity cost of time, $c(\omega)$, P is able to earn economic rents from the conservative T.

V. OPTIMAL FIXED FEE CONTRACT

In this section, we consider a setting in which T and P are barred from using a contingent fee contract. We incorporate this prohibition by adding the constraint $y_{AF} = y_{AU}$ to the first optimization problem considered earlier and $y_{CF} = y_{CU}$ to the second optimization problem. The optimal fixed fee contract for the aggressive taxpayer is characterized in proposition three.

Proposition 3: In the optimal fixed fee contract for the aggressive taxpayer:

$$\begin{aligned} \text{(a) } y_{AU}^* &= y_{AF}^* = c(\omega) \left[1 + \frac{2}{\gamma(2 - \omega)} \right]; \\ \text{(b) } E[y_A] &= c(\omega) \left[1 + \frac{2}{\gamma(2 - \omega)} \right]; \\ \text{(c) } V_A &= \frac{2c(\omega)}{\gamma(2 - \omega)}. \end{aligned}$$

Examination of the reformulated (IA2) constraint, equation (6), indicates that when $y_{AF} = y_{AU}$, only the value of T's future business can deter P from shirking and choosing the unfavorable reporting position. For this increase in business to be valuable, P must be paid a fixed fee that exceeds his opportunity cost, $c(\omega)$, which in turn causes the (IR) constraint to be nonbinding.

Proposition four characterizes the optimal fixed fee contract between the practitioner and the conservative taxpayer.

Proposition 4: In the optimal fixed fee contract for the conservative taxpayer:

$$\begin{aligned} \text{(a) } y_{CF}^* &= y_{CU}^* = c(\omega) \left[1 + \frac{2}{\gamma\omega} \right]; \\ \text{(b) } E[y_C] &= c(\omega) \left[1 + \frac{2}{\gamma\omega} \right]; \\ \text{(c) } V_C &= \frac{2c(\omega)}{\gamma\omega}. \end{aligned}$$

As in proposition three, the constraint $y_{CF} = y_{CU}$ implies that only the value of T's future business can motivate P to perform the research. Without this future business as a motivating force, P would shirk and choose the unfavorable reporting position.

VI. EFFECTS OF THE BAN ON CONTINGENT FEES

The ban on contingent fees has a direct effect on the expected cost of hiring the practitioner and an indirect effect on tax compliance. In the case of the aggressive taxpayer, the prohibition of contingent fees allows the practitioner to receive a higher expected fee and thereby receive economic rents, which enriches the practitioner at the expense of the

taxpayer. Although P receives economic rents from a conservative taxpayer both when contingent fees are allowed and banned, the expected fee in the fixed fee setting, $c(\omega)[1 + (2/\gamma\omega)]$, is greater than the expected fee in the contingent fee setting, $c(\omega)\{1 + [4/\alpha(\beta + \gamma)\omega]\}$. Therefore, conservative taxpayers are also better off when contingent fees are allowed.

The magnitude of the distributional effects of the ban on contingent fees depends on practitioner quality. For aggressive taxpayers, the practitioner's economic rents resulting from the ban increase in practitioner quality because V_A , the value of an aggressive client, is zero when contingent fees are allowed, but is positive and an increasing function of quality (because $c'(\omega) > 0$) when contingent fees are banned. Similarly, although the practitioner earns economic rents from conservative taxpayers in both the contingent and fixed fee settings, the effect of increasing quality on V_C is greater when contingent fees are prohibited because $c'(\omega) > 0$ and $c''(\omega) > 0$ implies $c(\omega)/\omega > 0$. High-quality practitioners thus benefit the most from the ban on contingent fees.

The ban on contingent fees has an indirect effect on taxpayer aggressiveness, and thus tax compliance, because the ban's effect on expected fees affects the cut-off value of λ , the point at which the taxpayer is indifferent between being aggressive and conservative. To examine the ban's effect on taxpayer aggressiveness, we first denote this indifference point as λ_{CF}^* when contingent fees are allowed, where the subscript CF denotes contingent fee. Comparing proposition one and proposition two indicates that $E[y_C] > E[y_A]$ when contingent fees are allowed. Substituting the values from proposition one and proposition two into equation (4) yields:

$$\lambda_{CF}^* = \lambda_{FB}^* + \frac{4c(\omega)}{\alpha D(\beta + \gamma)\omega}. \quad (10)$$

Equation (10) implies $\lambda_{CF}^* > \lambda_{FB}^*$. Therefore, some taxpayers who would have been conservative in the absence of moral hazard become aggressive when moral hazard is present and contingent fees are permitted.

Similarly, when the expected fixed fees from propositions three and four are substituted into equation (4), the value of the indifference point, denoted λ_{FF}^* , solves:

$$\lambda_{FF}^* = \lambda_{FB}^* + \frac{8c(\omega)}{\alpha D\gamma\omega(2 - \omega)}. \quad (11)$$

Comparing equations (10) and (11) allows us to examine the effect of prohibiting contingent fees on taxpayer aggressiveness. This comparison indicates that $\lambda_{FF}^* > \lambda_{CF}^*$. Thus, in our setting, the ban on contingent fees induces some taxpayers who would have been conservative with a contingent fee contract to become aggressive when using a fixed fee contract. Therefore, given the optimal incentive contracts, the ban on contingent fees will increase taxpayer undercompliance. This result is the opposite of what the IRS feared would result if contingent fees were allowed.

The economic intuition behind our result is that when fees are fixed, only the value of future business, which is increased by taking favorable reporting positions, motivates the practitioner to perform the research. The practitioner receives a greater benefit from preparing the return of an aggressive taxpayer because the practitioner takes the favorable reporting position when either the favorable or null signal is observed. The favorable signal must be observed, however, to take the favorable reporting position for a conservative

taxpayer, thereby making it more costly for conservative taxpayers to motivate the practitioner to engage in costly research. Therefore, it is less expensive for aggressive taxpayers to motivate the practitioner to do the research instead of just taking the unfavorable position without performing the research. The cost savings that result from inducing the practitioner to take the favorable reporting position when the tax law is ambiguous induces some taxpayers who would have been conservative when contingent fees are allowed to become aggressive when contingent fees are banned.

VII. CONCLUSIONS

This paper examines the distributional consequences of banning contingent fee arrangements for tax return preparation services and the resulting effect on taxpayer compliance. We develop a principal-agent model in which a taxpayer contracts with a tax practitioner to attempt to resolve tax law uncertainty. The optimal incentive contract must induce the practitioner to perform costly research and take the tax return reporting position that the taxpayer prefers.

The effect of moral hazard on the part of the practitioner is eliminated in the case of an aggressive taxpayer through the use of a contingent fee contract. For conservative taxpayers, a contingent fee contract is optimal, but the first-best outcome is not attained. Practitioners are able to earn economic rents from conservative taxpayers even when contingent fees are allowed.

Contingent fee contracts, however, violate Rule 302 of the AICPA Code of Professional Conduct and Section 10.28(b) of Treasury Circular 230. When only fixed fee arrangements are permitted, practitioners receive economic rents from both aggressive and conservative taxpayers. These additional rents increase with practitioner quality. Therefore, the ban increases practitioners' economic returns from increasing the quality of their services.

While the distributional effects of the continued ban on contingent fees are straightforward, the consequential effects on taxpayer aggressiveness and taxpayer compliance are inconsistent with conventional wisdom. The ban on contingent fees for engagements involving the preparation of an original tax return has been motivated by the IRS's fear that contingent fees would result in greater undercompliance with the tax law. In our model, however, some taxpayers, who would have been conservative if allowed to enter into contingent fee contracts, become aggressive when fees are fixed. Thus, the ban on contingent fees increases taxpayer undercompliance in our setting. This counterintuitive effect on taxpayer compliance occurs because without contingent fees practitioners can only be motivated by the effects of their current actions on their ability to retain the taxpayer as a client and generate valuable future business. Because this future business hinges on the ability of the practitioner to generate favorable reporting positions, it is more expensive to motivate the practitioner when the taxpayer is unwilling to take aggressive positions in the face of tax law ambiguity.

Our analysis assumes that the IRS's audit strategy is the same under the contingent fee regime as it is under a fixed fee regime. It is possible that the IRS would respond to the increase in undercompliance caused by the ban on contingent fees by increasing its audit rate. If that were to occur, the ban on contingent fees would result, at least in part, in higher audit costs instead of higher taxpayer undercompliance.

APPENDIX

Proof of Proposition 1

Recall that in the first-best case, the objective function is $c(\omega)$. It is sufficient to note that when $y_{AU}^* = 0$ and $y_{AF}^* = 2c(\omega)/(2 - \omega)$, each constraint is satisfied and the objective

function equals $c(\omega)$. Because we cannot do better than the first-best outcome, the proposed solution must be optimal and $E[y_A] = c(\omega)$. Finally, substituting the values of y_{AU}^* and y_{AF}^* into equation (5a) shows that $V_A = 0$. QED

Proof of Proposition 2

First, note that $V_C > 0$. If $V_C = 0$, (IR) would be binding, and so (AS1) and (AS3) would jointly imply $y_{CU}^* = y_{CF}^*$. (IA2) would then imply $c(\omega) \leq 0$, which contradicts the model's assumption that $c(\omega) > 0$ for all $\omega > 0$. Therefore, $V_C > 0$, which implies the (IR) constraint is not binding. Because x is assumed to be arbitrarily large, the (IA1) and (AS2) constraints are satisfied. Substituting V_C from equation (5b) yields the following simplified constraints.

$$y_{CF} \geq y_{CU} \left[1 - \frac{2\gamma}{2 + \gamma\omega} \right] + \frac{2c(\omega)}{\omega} \quad (\text{IA2})$$

$$y_{CF} \geq y_{CU} \left[1 - \frac{2\gamma}{2 + \gamma\omega} \right] + \frac{2\gamma c(\omega)}{2 + \gamma\omega} \quad (\text{AS1})$$

$$y_{CF} \leq y_{CU} + \frac{2[y_{CU} - c(\omega)](\alpha\beta - 2\gamma + \alpha\gamma)}{4 - \omega(\alpha\beta - 2\gamma + \alpha\gamma)} \quad (\text{AS3})$$

If (IA2) is satisfied, then (AS1) will necessarily be satisfied. The simplified optimization problem becomes:

$$\min_{y_{CF}, y_{CU}} \frac{\omega y_{CF}}{2} + \left(1 - \frac{\omega}{2} \right) y_{CU}$$

subject to:

$$y_{CF} \geq y_{CU} \left[1 - \frac{2\gamma}{2 + \gamma\omega} \right] + \frac{2c(\omega)}{\omega}, \quad (\text{IA2})$$

$$y_{CF} \leq y_{CU} + \frac{2[y_{CU} - c(\omega)](\alpha\beta - 2\gamma + \alpha\gamma)}{4 - \omega(\alpha\beta - 2\gamma + \alpha\gamma)}. \quad (\text{AS3})$$

Both constraints are binding. To see this, suppose only the (IA2) constraint was binding.

Then $y_{CF} = y_{CU} \left[1 - \frac{2\gamma}{2 + \gamma\omega} \right] + \frac{2c(\omega)}{\omega}$, and the objective function would become $c(\omega)$

+ $\frac{2y_{CU}}{2 + \gamma\omega}$. The solution would be $y_{CF} = \frac{2c(\omega)}{\omega}$ and $y_{CU} = 0$, which implies $V_C = 0$ and

would violate (AS3). Suppose instead only the (AS3) constraint was binding. Then y_{CF}

= $y_{CU} + \frac{2[y_{CU} - c(\omega)](\alpha\beta - 2\gamma + \alpha\gamma)}{4 - \omega(\alpha\beta - 2\gamma + \alpha\gamma)}$, and the objective function would become

$\frac{4y_{CU} - \omega c(\omega)[\alpha\beta - 2\gamma + \alpha\gamma]}{4 - \alpha\beta\omega + \gamma\omega(2 - \alpha)}$. If the denominator of this expression is positive, then y_{CU}

= 0 and $y_{CF} = \frac{-2c(\omega)(\alpha\beta - 2\gamma + \alpha\gamma)}{4 - \omega(\alpha\beta - 2\gamma + \alpha\gamma)}$, which violates (IR). If the denominator is negative,

then y_{CU} is set arbitrarily large, which violates (AS1). The two binding constraints (IA2) and (AS3) are satisfied by $y_{CU} = \frac{2c(\omega)(2 + \gamma\omega)}{\alpha(\beta + \gamma)\omega}$ and $y_{CF} = \frac{2c(\omega)}{\omega} + \frac{2c(\omega)(2 - 2\gamma + \gamma\omega)}{\alpha(\beta + \gamma)\omega}$.

Evaluating the objective function at the optimal solution yields $E[y_C] = c(\omega) \left[1 + \frac{4}{\alpha(\beta + \gamma)\omega} \right]$. Finally, substituting the solution into equation (5b) shows that $V_C = \frac{4c(\omega)}{\alpha(\beta + \gamma)\omega}$. QED

Proof of Proposition 3

The prohibition against contingent fees ensures that $y_{AF}^* = y_{AU}^* = y_A^*$, which implies $V_A = y_A - c(\omega)$. If $y_A = c(\omega)$, (IA2) simplifies to $c(\omega) \leq 0$; therefore, $y_A > c(\omega)$ and consequently the (IR) constraint is not binding. Because x is assumed to be arbitrarily large, the (IA1) and (AS2) constraints are satisfied. Simplifying (IA2) yields:

$$y_A \geq c(\omega) \left[1 + \frac{2}{\gamma(2 - \omega)} \right]. \quad (\text{IA2})$$

When (IA2) is satisfied, (AS1) and (AS3) are also satisfied. The simplified program becomes:

$$\min_{y_A} y_A$$

subject to:

$$y_A \geq c(\omega) \left[1 + \frac{2}{\gamma(2 - \omega)} \right]. \quad (\text{IA2})$$

The optimal fixed fee contract is $y_A^* = c(\omega) \{1 + [2/\gamma(2 - \omega)]\}$. Because the contract features fixed fees, this is also the expected cost of hiring a practitioner, $E[y_A]$. Finally, substituting y_A^* into equation $V_A = \left(1 - \frac{\omega}{2}\right)y_{AF} + \frac{\omega y_{AU}}{2} - c(\omega)$ (5a) yields $V_A = 2c(\omega)/\gamma(2 - \omega)$. QED

Proof of Proposition 4

The prohibition against contingent fees ensures that $y_{CF}^* = y_{CU}^* = y_C^*$, which implies $V_C = y_C - c(\omega)$. If $y_C = c(\omega)$, (IA2) simplifies to $c(\omega) \leq 0$; therefore, $y_C > c(\omega)$ and consequently the (IR) constraint is not binding and the (AS1) constraint is not binding. Because x is assumed to be arbitrarily large, the (IA1) and (AS2) constraints are satisfied. Because $\gamma < \alpha\beta/2$, the (AS3) constraint is satisfied. Simplifying (IA2) yields:

$$y_C \geq c(\omega) \left[1 + \frac{2}{\gamma\omega} \right]. \quad (\text{IA2})$$

When (IA2) is satisfied, (AS1) is also satisfied. The simplified program becomes:

$$\min_{y_C} y_C$$

subject to:

$$y_C \geq c(\omega) \left[1 + \frac{2}{\gamma\omega} \right]. \quad (\text{IA2})$$

The optimal fixed fee contract is $y_C^* = c(\omega)[1 + (2/\gamma\omega)]$. Because the contract features fixed fees, this is also the expected cost of hiring a practitioner, $E[y_C]$. Finally, substituting y_C^* into equation $V_C = \frac{\omega y_{CF}}{2} + \left(1 - \frac{\omega}{2}\right)y_{CU} - c(\omega)$ (5b) yields $V_C = 2c(\omega)/\gamma\omega$. QED

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Abnormal Returns to a Fundamental Analysis Strategy

Jeffery S. Abarbanell

University of North Carolina at Chapel Hill

Brian J. Bushee

Harvard University

ABSTRACT: We examine whether the application of fundamental analysis can yield significant abnormal returns. Using a collection of signals that reflect traditional rules of fundamental analysis related to contemporaneous changes in inventories, accounts receivables, gross margins, selling expenses, capital expenditures, effective tax rates, inventory methods, audit qualifications, and labor force sales productivity, we form portfolios that earn an average 12-month cumulative size-adjusted abnormal return of 13.2 percent. We find evidence that the fundamental signals provide information about future returns that is associated with future earnings news. Moreover, a significant portion of the abnormal returns is generated around subsequent earnings announcements. These findings are consistent with the underlying focus of fundamental analysis on the prediction of earnings. Significant abnormal returns to the fundamental strategy are not earned after the end of one year of return cumulation, indicating little support for the idea that the signals capture information about multiple-year-ahead earnings not immediately impounded in price or about long-term shifts in firm risk. Additional analysis on a holdout sample suggests that the strategy continues to generate abnormal returns in a period subsequent to the introduction of the fundamental signals in the literature, and contextual analyses indicate that the strategy performs better for certain types of firms (e.g., firms with prior bad news).

Key Words: *Fundamental analysis, Market efficiency, Stock returns, Contextual analysis.*

Data Availability: *All data are available from public sources.*

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I. INTRODUCTION

We examine whether the application of fundamental analysis can yield significant abnormal returns. This question is motivated by growing evidence in the accounting and finance literature that prices fail to immediately reflect publicly available information, especially earnings news (Bernard and Thomas 1989; Sloan 1996). The exploitation of such "market mispricing" is often cited as a justification for engaging in fundamental analysis—a practice that relies heavily on the analysis of current and past financial statement data to identify when underlying firm value differs from prevailing market prices.

Our work begins where Lev and Thiagarajan (1993) (hereafter LT) and Abarbanell and Bushee (1997) (hereafter AB) leave off. LT introduce several empirical proxies, referred to as fundamental signals, that reflect relations in current accounting data that are purported to predict future earnings changes. The collection of signals, which includes information about changes in inventories, accounts receivables, gross margins, selling expenses, capital expenditures, effective tax rates, inventory methods, audit qualifications, and labor force sales productivity, represent traditional rules of fundamental analysis employed by professional financial analysts to predict future firm performance. LT demonstrate the value relevance of these signals by showing they are significantly associated, in the directions predicted, with stock returns calculated contemporaneously with disclosure of the signals.

AB test whether the signals' association with contemporaneous returns can be explained by their ability to predict future earnings—an underlying premise of fundamental analysis. They present evidence that many of the fundamental signals are associated with subsequent actual earnings changes. They also show that analysts' revisions of earnings forecasts subsequent to the signals' disclosure underreact to information in the signals, leading to predictable forecast errors. Analyst underreaction suggests the possibility that contemporaneous stock price adjustment to the information in the signals may not be complete. In this paper, we carry out the next logical step in the analysis by devising an investment strategy based upon fundamental analysis that should yield abnormal returns as earnings are realized in the future if contemporaneous stock price reactions to the signals are incomplete. We show that an average 12-month cumulative size-adjusted abnormal return of 13.2 percent is earned on hedge portfolios formed on the basis of the decile ranks of the fundamental signals over the sample period 1974–1988.

We also perform tests to discriminate between mispricing as an explanation for observed abnormal returns to the strategy and alternative explanations, including the signals' association with shifts in (or misestimation of) expected returns attributable to unknown risk factors and/or institutional obstacles to exploiting mispricing (Ball 1992). Our results indicate that abnormal returns are highly associated with the realization of one-year-ahead earnings changes, do not persist into the second year of the strategy, are unusually concentrated around the subsequent quarterly earnings announcements, and are unaffected by controls for Fama and French's (1992) risk factors. These results suggest that "unaccounted for risk" is not a complete explanation for the success of the strategy. Similarly, the strategy appears to perform well when trading is restricted to large firms (ameliorating potential price pressure effects) and when short selling is eliminated. Moreover, optimal weights determined from our regressions indicate abnormal returns are not driven by extreme portfolio positions, adding support to the exploitability of the strategy.

Using these results and lessons from AB, we apply a refined version of our fundamental strategy on a hold-out sample that covers 1989–1993, a period subsequent to introduction of the fundamental signals in the accounting literature. Though the implementation of the strategy includes conservative elements, such as limiting trades in a firm's security to no

more than once each year, investing in only large firms, and exploiting only contextual refinements that do not require forecasts of macroeconomic variables, we nevertheless find evidence that adherence to the strategy over several years can earn abnormal returns without generating large losses in any given year.

Our study contributes to the body of work that attempts to describe how current and past outputs of financial reporting systems translate into firm value, including Ohlson (1995) and Feltham and Ohlson (1995) who follow an analytical approach, and Ou and Penman (1989a, 1989b), Penman (1992), LT and AB who employ empirical methodologies. The relations between fundamental signals and contemporaneous price changes reported in prior empirical studies suggest that detailed information captured by accounting provides value-relevant information. The mere association between accounting information and contemporaneous prices, however, is not sufficient to pronounce the market efficient with respect to this information. To the extent that prices do not immediately impound all the information relevant to valuing a firm, our future return results suggest that some of the tools required to improve the efficiency of prices (or alternatively, exploit mispricing) may be found in the practice of fundamental analysis. Furthermore, our work identifies specific rules of fundamental analysis supported by straightforward economic reasoning that are not completely reflected in market prices. Thus, our work extends knowledge of relations between accounting numbers and firm value.

The next section provides a brief background of prior research related to the current study. In section III, we describe the accounting signals on which our fundamental strategy is based and the simple fundamental strategy we employ to construct annual hedge portfolios. Section IV reports the results of our empirical tests. Sensitivity tests are discussed in section V. We summarize our findings and conclude the paper in section VI.

II. RELATED RESEARCH

In this study, we build on prior research to test the possibility that abnormal stock returns can be earned using fundamental analysis. One condition for earning abnormal returns is that the information generated by a fundamental analysis predicts future economic variables that will eventually be priced by the market. Earlier work by LT introduces a collection of "fundamental signals" that reflect relations in current accounting data that are purported to predict future earnings changes. They demonstrate the value relevance of these signals by showing they are significantly associated, in the directions predicted, with stock returns calculated contemporaneously with the disclosure of the signals. AB find direct evidence that both future earnings and, to a lesser extent, analysts' forecast revisions of future earnings are significantly associated with several of the signals over the sample period they examine. This direct evidence of a relation between individual signals and future earnings suggests that the observed association between contemporaneous returns and the fundamental signals reflects, in part, the signals' ability to predict value-relevant information.

A second condition for earning abnormal returns using fundamental analysis is that the market temporarily underuses the information in the fundamental signals about future economic variables. AB present indirect evidence of this possibility by examining *ex post* analysts' forecast errors. Their results reveal that analysts' forecasts do not reflect, on a timely basis, all of the information about future earnings contained in the fundamental signals. The finding that relatively sophisticated analysts appear to *underuse* systematically the information in the fundamental signals when producing earnings forecasts raises the possibility that security prices also fail to reflect fully this information. Additional tests in AB suggest that contemporaneous stock prices reflect some of the information underused

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by analysts in revising their forecasts of future earnings, but their tests cannot confirm whether all of the information in the signals is impounded immediately into price.¹

Our approach to identifying temporary mispricing using fundamental analysis emphasizes the prediction of future earnings, similar to Ou and Penman (1989a). However, our approach differs from theirs in two important ways. First, Ou and Penman (1989a) do not attempt to identify *a priori* conceptual arguments for studying any of their explanatory variables or to test competing hypotheses for how they might be related to future earnings. They start with an exhaustive list of accounting ratios that have been used to describe firms' leverage, activity and profitability, and rely on univariate associations between these variables and future earnings changes to limit the number of predictors on which to focus. Nevertheless, their approach retains a fairly large number of explanatory variables, some of which fail to inspire any obvious logic as to why they would be good predictors of future earnings. Moreover, the set of predictors changes from one short estimation period to the next without any follow-up analysis to explain why, making it both difficult to pinpoint the economic forces reflected in these variables and to exploit a consistent strategy across time. In contrast, we focus our strategy on a small number of variables specifically motivated by arguments for why these signals would be expected, *a priori*, to be related to future earnings changes.² In cases where a hypothesized relation was opposite to that expected, we rely on the results of supplemental contextual analyses performed by AB to justify our attempts to exploit that observed relation in a subsequent period.

Second, Ou and Penman (1989a) combine their predictors into a single summary measure, *Pr*, obscuring the individual signals' contribution to earning abnormal returns and limiting the extent of knowledge gained about fundamental analysis. By maintaining a focus on individual signals throughout our analysis, we can evaluate the robustness of each signals' predictive power and explore contextual factors that influence their informativeness. We believe that such a systematic program of hypothesis development and directed empirical testing is a more effective approach to discriminating among alternative explanations for observed relations.

A common criticism of strategies that purport to exploit pricing anomalies is that they actually identify changes in expected returns brought on by shifts in unexplained risk factors (Ball 1992; Stober 1992). Though identification of shifts in firm risk through the practice of fundamental analysis is interesting and deserving of future research attention, if observed "abnormal" returns are solely attributable to a strategy's ability to reflect changes in risk,

¹ Abarbanell (1991) also shows that while analysts' forecasts are positively related to prior stock returns, their forecasts do not fully reflect the information in price changes. Conversely, other evidence indicates that analysts are more efficient than the market in certain cases. For example, Abarbanell and Bernard (1992) present evidence that analysts' earnings forecast errors cannot account entirely for mispricing in the form of post-earnings-announcement drift. This empirical evidence suggests that analysts' forecast errors are not, at any given time, sufficient for price corrections and that price corrections are not sufficient for the errors in analysts' forecasts. Even if all future price corrections could be completely explained by analysts' *ex post* earnings forecast errors (which are, in turn, explained, *ex ante*, by information underutilized in the fundamental signals), the formulation of an implementable investment strategy to exploit this information is still required to demonstrate the magnitude and significance of trading profits.

² A potentially adverse consequence of ignoring conceptual links between the signals and future earnings or of failing to perform follow-up analyses is evident from the results reported by Holthausen and Larcker (1992). They report that the Ou and Penman (1989a) strategy for predicting the sign of earnings changes fails to earn abnormal returns in sample years subsequent to the original estimation periods. They also show that bypassing the earnings prediction step and moving to a direct prediction of future returns is an effective strategy for earning abnormal returns, suggesting the serious effects from overfitting data in the Ou and Penman (1989a) program. Though our less data-intensive approach to identifying earnings predictors may fail to consider all possible relevant accounting data, we are able to interpret our results in light of a set of hypothesized relations motivated by economic reasoning.

the traditional arguments for advocating such analyses would not be justified. Therefore, a second purpose of the study is to assess the extent to which the fundamental signals' association with abnormal returns coincides with their ability to convey information about future earnings rather than shifts in risk.

Finally, the recent documentation of several instances in the accounting and finance literature where stock prices fail to immediately reflect publicly available information raises a question about the independence of our evidence from that previously reported pricing anomalies (Lakonishok et al. 1994; Sloan 1996). Many of the fundamental signals we study are comprised of working capital items, suggesting the possibility that returns to the fundamental strategy may be related to the market's failure to recognize that the accrual component of earnings is of lower persistence than the cash flows component, a phenomenon documented by Sloan (1996). Robustness tests confirm that controls for Sloan's accrual anomaly, as well as the book-to-market and size effects, do not impact our results. Thus, the strategy's success appears to be independent of previously reported anomalies.

III. METHODOLOGY

The Fundamental Signals

We examine nine fundamental signals used by LT and AB as predictors of contemporaneous returns, future earnings and analysts' forecast revisions. These signals are described in table 1. To simplify exposition, the signals have been defined to produce variables that are identical in magnitude to those created from the definitions in table 1 of both LT and AB, but of opposite signs. This table also summarizes the signals' observed relations to both current returns and future earnings as reported by AB (adjusted for the sign change just described) for the sample period studied in this paper.

The percentage difference between sales and its expected value less an analogous measure for the value of inventory is denoted INV. When finished goods inventory increases faster than sales, it is conjectured to be bad news for earnings and vice versa.³ An increase (decrease) in the percentage change in gross margin relative to sales, GM, indicates an improvement (deterioration) in the firm's terms of trade and, hence, expected operating performance. The labor force variable, denoted LF and calculated as the change in sales per employee, measures the effects of restructuring activities. Reductions in labor force for a given scale of operations are usually described in a positive light by analysts. The variable ETR measures the effective tax rate. It is intended to capture changes in the effective tax rate not attributable to permanent factors such as statutory rate changes. Thus, a decline (increase) in the effective tax rate indicates that earnings will not persist at current levels and this bodes poorly (well) for future economic performance. As seen in table 1, the evidence supports these signals' hypothesized relations to future earnings and, with the exception of the LF signal, to contemporaneous returns.

The AR signal represents the change in accounts receivable relative to the change in sales. As defined in this paper, a decrease in the AR signal was expected to indicate cash collection difficulties and larger bad debts expenses in the future or, alternatively, an early warning of a sales slowdown. Contrary to expectation, table 1 reveals (as reported in AB) that the AR signal, as defined here, has an observed negative association with future earnings, suggesting that an expansion of accounts receivables relative to sales, on average, is

³ A recent "Heard on the Street" column in the *Wall Street Journal*, "Bloated Inventories at Retailers May Mean Trouble for Investors," is representative of arguments made by analysts for interpreting a decrease in the inventory signal as bad news (Pulliam 1997). A detailed discussion of the potential information conveyed by the fundamental signals can be found in LT (192–198).

TABLE 1
Definitions of Fundamental Signals and Observed Empirical Relations Between Signals and Current Stock Returns and Future Earnings

Signal	Measurement ^a	Observed Relation with Current Stock Returns ^b	Observed Relation with One-Year-Ahead Earnings ^c	Observed Relation with Long-Term Earnings Growth ^d
Inventory (INV) ^e	$\Delta \text{Sales} (12)^d - \Delta \text{Inventory} (78 \text{ or } 3)$	+	+	
Accounts Receivable (AR)	$\Delta \text{Sales} - \Delta \text{Accounts Receivable} (2)$		-	
Capital Expenditures (CAPX)	$\Delta \text{Firm CAPX} (30) - \Delta \text{Industry CAPX}^*$		-	-
Gross Margin (GM)	$\Delta \text{Gross Margin} (12-41) - \Delta \text{Sales}$	+	+	
Selling and Administrative Expenses (S&A)	$\Delta \text{Sales} - \Delta \text{S\&A} (189)$	+		
Effective Tax Rate (ETR)	$\left[\text{ETR}_t - \left(\frac{1}{3} \sum_{\tau=1}^3 \text{ETR}_{t-\tau} \right) \right] \times \text{CHGEPSt}$	+	+	+
	where $\text{ETR}_t = \frac{\text{TaxExpense}(16)_t}{\text{EBT}(170 + 65)_t}$			
Earnings Quality (EQ)	1 for LIFO, 0 for FIFO or other (59)			+
Audit Qualification (AQ)	1 for Unqualified, 0 for Qualified or other (149)			
Labor Force (LF)	$\left(\frac{\text{Sales}_t}{\text{Employees}(29)_t} - \frac{\text{Sales}_{t-1}}{\text{Employees}_{t-1}} \right) / \frac{\text{Sales}_{t-1}}{\text{Employees}_{t-1}}$		+	+

^a The Δ operator represents a percentage change in the variable from its average over the past two years; e.g. $\Delta \text{Sales} = [\text{Sales}_t - \text{E}(\text{Sales}_t)] / \text{E}(\text{Sales}_t)$, where $\text{E}(\text{Sales}_t) = (\text{Sales}_{t-1} + \text{Sales}_{t-2}) / 2$. The variables are defined such that their expected relation with current stock returns and future earnings is positive, contrary to the definition of the signals used in Lev and Thiagarajan (1993) and Abarbanell and Bushee (1997), who define the signals to have negative relations.

^b The empirical relations are based on a sample of 14,453 firms between 1974 and 1988.

^c The Inventory variable is finished goods when available, total inventory otherwise.

^d Numbers in parentheses represent Compustat item numbers.

^e Industry Capital Expenditures were calculated by aggregating firm figures for all firms with the same two-digit SIC code.

^f CHGEPSt is the change in earnings per share between years $t-1$ and t , deflated by stock price at the end of year $t-1$.

a leading sales and earnings indicator. Similarly, the CAPX signal, which was constructed to test the notion that it is good news for future earnings when firm-specific capital expenditures outpace industry average capital expenditures, yields results directly opposite to what was hypothesized.

Increases (decreases) in selling and administrative expenses relative to the percentage change in sales, denoted S&A, signal increases (decreases) in the indirect cost structure of the firm and, thus, decreases (increases) in future earnings. Two dummy variables are used to test general notions of earnings quality. The LIFO dummy variable, EQ, quantifies the belief that LIFO-based earnings are of higher quality than FIFO-based earnings, indicating greater sustainable earnings in the future. Audit qualifications, denoted AQ, capture the idea that firms unable to avoid qualification will have lower sustainable earnings in the future. Table 1 shows there is little empirical support for these hypotheses to be found in the signals' relations to returns and future earnings over the period we examine.

Hedge Portfolio Construction and the Fundamental Strategy

We wish to determine if the fundamental signals described above contain information not immediately impounded in price. Evidence that the market underreacts to accounting information has been apparent in the literature since Ball and Brown (1968) and consistently supported in subsequent research; see e.g., Bernard and Thomas (1989, 1990) and Ou and Penman (1989a, 1989b).⁴ In addition, AB report that analysts' forecasts appear to underreact, specifically, to the information in the fundamental signals we examine in this study. Therefore, we form an investment strategy assuming that the market underreacts to the information in the signals and determine the abnormal returns to such a strategy. Furthermore, because all of the fundamental signals are motivated by their implications for future earnings, we predict that subsequent prices will capture the information in the fundamental signals as actual earnings are revealed. We examine post-signal-announcement return cumulation periods of up to 36 months for evidence of price corrections.

The strategy we implement relies on the construction of zero-investment portfolios (Fama and Macbeth 1973). Portfolios are formed as follows:

1. For each of the years 1974–1988, select firms with December fiscal year-ends that announce their earnings (according to Compustat) prior to March 31.⁵
2. Compute the values of the fundamental signals, contemporaneous earnings change and beta for each firm.
3. Calculate the scaled decile rank for each variable described above (except the dummy variables AQ and EQ) by ranking the values of the variables into deciles (0,9) each year and dividing the decile number by nine so that each signal observation takes on a value ranging between zero and one. The AQ and EQ signals retain their values of zero or one.
4. Determine the weights to be assigned to each security in an annual portfolio by means of the following regression:

⁴ Abarbanell and Bernard (1992, 1185) point out that though there is evidence of overreaction in prices, it has not been shown to be associated with earnings or other accounting information.

⁵ If a firm changes its fiscal year-end during the sample period, we drop only the observation from the year in which the change occurred. This screen avoids the distorting effect of short fiscal years on the computation of the fundamental signal variables.

$$\begin{aligned} \text{BHAR}(+m)_{i,t} = & a_0 + \sum_{k=1}^9 a_k \text{RSIGNAL}_{k,i,t} + a_{10} \text{RBETA}_{i,t} \\ & + a_{11} \text{RCEPS}_{i,t} + e_{i,t} \end{aligned} \quad (1)$$

where:

$\text{BHAR}(+m)_{i,t}$ = the size-adjusted, buy-and-hold abnormal return of firm i cumulated from the fourth month after the fiscal year-end of year t through m subsequent months;

$\text{RSIGNAL}_{k,i,t}$ = scaled decile rank of fundamental signal k for firm i in year t ;

$\text{RBETA}_{i,t}$ = the scaled decile rank of beta for firm i at the end of fiscal year t . Betas are calculated by regressing monthly firm returns on a value-weighted market index over a prior 36-month estimation period; and

$\text{RCEPS}_{i,t}$ = the scaled decile rank of the change in earnings between years $t - 1$ and t , deflated by stock price at the end of year $t - 1$, for firm i .

An individual coefficient represents the abnormal return to a zero-investment portfolio optimally formed to exploit the information in the associated independent variable that is orthogonal to the information in the other independent variables. In other words, the weighted average of the associated independent variable (measured in scaled decile ranks) is one and the weighted averages of the other independent variables are zero. These portfolios are constructed with OLS-derived weights for each independent variable for each firm that are given by the rows of the matrix $(X'X)^{-1}X'$, where $X = [1, \text{RSIGNAL}_k, \text{RBETA}, \text{RCEPS}]$. Because the portfolio weights do not require knowledge of the future abnormal returns, we are investigating implementable investment strategies.

The inclusion of an intercept in equation (1) ensures that the portfolio weights for the slope coefficients sum to zero, implying zero investment portfolios (see Fama and Macbeth (1973) for details). The inclusion of RCEPS implies that abnormal returns to a signal can be interpreted as arising from information about future economic conditions that are not reflected in current earnings.⁶ Finally, because we have included RBETA in the regressions, this implies all other regression coefficients can be interpreted as abnormal returns to zero- β portfolios.⁷

Our strategy involves positions in only December fiscal-year-end firms that have reported results by April to allow for the determination of the portfolio weights from $(X'X)^{-1}X'$ used to determine investment positions. Firms receiving negative weights are sold short and firms with positive weights are purchased. The long and short positions are

⁶ Both LT and AB include contemporaneous earnings changes in their price association tests to determine if the fundamental signals have incremental explanatory power for contemporaneous returns. Because some studies report evidence of market underreaction to current year's earnings news (Klein 1990), we incorporate contemporaneous earnings changes as a control variable.

⁷ The results reported below are similar when actual betas, rather than their scaled decile ranks, are included in the regressions.

closed after specified common periods have elapsed (e.g., one year). The abnormal return to our fundamental strategy is the sum of the coefficients on the fundamental signals.⁸

Note that AB reports the AR and CAPX signals, as defined in this study, are actually negative predictors of contemporaneous returns and one-year-ahead earnings over a period covering the second half of the 1970s and all of the 1980s, suggesting that the ranked values of these variables should be reversed if the strategy is to exploit underreaction. However, because these relations were verified using data from the same sample period we employ for testing our strategy, we avoid introducing hindsight biases by adhering to the relations originally hypothesized. This feature of our design works against finding significant underreaction in the portfolios we construct. We take advantage of the empirical relations reported by AB in subsequent tests that evaluate the fundamental strategy in the early 1990s.

Data and Sample Selection

Data used to compute the fundamental signals are taken from the 1995 Compustat PST Active and Research files. The definitions in table 1 include a description of the Compustat data items required to calculate the fundamental signals. The yearly distributions of fundamental signal values are truncated according to the program outlined in LT (199) to eliminate extreme values caused by small denominators. The source of return data was the 1995 CRSP daily NYSE/AMEX File. Our main sample includes observations from 1974–1988. Our holdout sample covers the 1989–1993 period.

To avoid the possibility of survivorship biases, we include data from the Compustat Research file to calculate the fundamental signals for delisted firms. Return data for delisted-firm observations are identified through historical CUSIPS on CRSP. Requiring a complete set of fundamental variables leaves a sample size for 1974–1988 of 16,538, with yearly numbers of observations between 815 and 1,352. No single variable accounts for a significant diminution of sample size. Limiting our tests to December 31 fiscal-year-end firms with Compustat earnings announcements dates on before March 31 reduces the total sample size to 9,764, ranging between 469 and 785 observations in each year.

Daily size-adjusted abnormal returns are cumulated through the third month of the following year. To calculate the abnormal returns, we compound the daily returns to a security over given cumulation periods and then subtract the mean daily compounded return of the value-weighted firm-size decile to which the security belongs over the same period.⁹ That is:

$$BHAR(+m)_{i,t} = \prod_{j=1}^M (1 + R_{ij}) - \prod_{j=1}^M (1 + SAR_{kj}) \quad (2)$$

⁸ The portfolio weights determined by the regressions in equation (1) are optimal assuming a linear relationship between the dependent and independent variables. Nevertheless, we replicated all of the tests in the paper employing hedge portfolios formed by subtracting the average return from buying securities in the highest decile of the distributions of each fundamental signal from the return earned by selling securities in the lowest decile of the distribution of each fundamental signal. These portfolio returns were summed to obtain the return to the strategy. The method is analogous to that used by Sloan (1996). After controlling for the contemporaneous earnings change by calculating the hedge portfolio returns within earnings change deciles, our results were similar to those generated from the regression approach in equation (1).

⁹ The use of size-adjusted returns does not ensure a perfect control for size. Bernard et al. (1997, 103) argue that this control can “leave traces of the size effect that could influence the results in unpredictable ways.” Our tests were re-estimated using raw returns and market-adjusted returns (raw returns less a value-weighted index). Results for these measures were uniformly stronger than those reported below for size-adjusted returns. Thus, it appears that our results are not induced by the manner in which abnormal returns are calculated.

where R_{ij} represents the return to security i on day j , SAR_{kj} is the mean return on day j to the size portfolio, k , to which security i belongs, and M is the number of trading days in the m month cumulation period. For firms that delist, we include the delisting return and, thereafter, the returns for the firm are reinvested in the size portfolio to which it belongs (implying zero abnormal returns for the remainder of the year). For long-window return results, the portfolios are re-formed at the end of each 12-month period on the basis of the original signal disclosure, using only those firms still remaining in the data set.

IV. EMPIRICAL RESULTS

Returns to the Portfolio Strategy

Column 1 of table 2, panel A presents the average portfolio returns to the fundamental strategy over the 1974–1988 period for cumulation periods ending within the first 12 months following the disclosure of the fundamental signals. Yearly portfolio returns within each cumulation period were obtained from the regression given in equation (1) by summing the individual coefficients on the nine signals. We include the number of years that the portfolio returns are positive (and significant) and results of t -tests of the significance of the portfolio mean returns over the 15 years. The t -statistic on the average return is positive and highly significant for all cumulation periods after the sixth month of cumulation. The mean return peaks after 11 months and levels off at 13.2 percent after one year. Returns to the strategy after 12 months of cumulation are positive in 10 of 15 individual years and significantly different from zero at or below the five percent level in five of these years. None of the negative abnormal returns were large or significant in the five years in which the strategy failed.¹⁰

To provide a benchmark for assessing the magnitude of returns to future earnings news, we rank the sample firms' earnings changes from the year subsequent to the fundamental signal disclosure into deciles, and scale the decile numbers to take on values between zero and one. We then run the regression in equation (3) below and interpret the slope coefficients as a portfolio return in the manner described earlier.

$$BHAR(+m)_{i,t} = \gamma_0 + \gamma_1 RBETA_{i,t} + \gamma_2 RCEPS_{i,t+1} + e_{i,t} \quad (3)$$

where:

$RCEPS_{i,t+1}$ = the scaled decile rank of the change in earnings between years t and $t + 1$, deflated by stock price at the end of year $t - 1$, for firm i (other terms are defined previously).

Column 2 of table 2, panel A presents the returns to this perfect foresight (with respect to one year-ahead-earnings) portfolio for increasingly longer cumulation periods. The size-adjusted return to the portfolio is approximately 13 percent at the end of one quarter of cumulation, increases to 23 percent after six months, and reaches 42 percent by the end of one year. The perfect foresight returns in the first year are comparable to those reported by Beaver et al. (1979) for a combined long position in the top two (out of 25) ranked earnings change portfolios and a short position in the bottom two portfolios. Comparing these perfect foresight abnormal returns in column 2 to those generated by the fundamental strategy

¹⁰ The average adjusted R^2 for this regression is 2.9 percent. The average adjusted R^2 for a model containing only the current earnings change and beta is 1.3 percent. Average adjusted R^2 s for subsequent regressions are similar in magnitude and are not reported.

TABLE 2
Mean Size-Adjusted Portfolio Returns to Fundamental Signal Strategy and to Perfect Foresight Strategy

Fundamental Signal Strategy:

$$BHAR(+m)_{p,t} = \sum_{k=1}^9 \hat{\alpha}_p \text{ where } \hat{\alpha}_j \text{ is estimated from } BHAR(+m)_{i,t} = \alpha_0 + \sum_{k=1}^9 \alpha_j R SIGNAL_{k,i,t} + \alpha_{10} RBETA_{i,t} + \alpha_{11} RCEPS_{i,t} + e_{i,t}$$

Perfect Foresight Strategy:

$$BHAR(+m)_{p,t} = \hat{\gamma}_2 \text{ where } \hat{\gamma}_2 \text{ is estimated from } BHAR(+m)_{i,t} = \gamma_0 + \gamma_1 RBETA_{i,t} + \gamma_2 RCEPS_{i,t+1} + e_{i,t}$$

Panel A: Mean Size-Adjusted Portfolio Returns to Strategies

Cumulation Period	Fundamental Signal Strategy		Perfect Foresight Strategy	
	Overall Mean ^b	Positive Years ^c	Overall Mean	Positive Years
BHAR(+1) _p	0.032**	10 (6)	0.056**	15 (15)
BHAR(+2) _p	0.011	10 (3)	0.089**	15 (15)
BHAR(+3) _p	0.017	10 (4)	0.128**	15 (15)
BHAR(+4) _p	-0.006	8 (4)	0.184**	15 (15)
BHAR(+5) _p	0.032	10 (5)	0.205**	15 (15)
BHAR(+6) _p	0.064	11 (7)	0.232**	15 (15)
BHAR(+7) _p	0.063*	11 (5)	0.273**	15 (15)
BHAR(+8) _p	0.092**	11 (6)	0.333**	15 (15)
BHAR(+9) _p	0.132**	11 (9)	0.350**	15 (15)
BHAR(+10) _p	0.122**	10 (7)	0.367**	15 (15)
BHAR(+11) _p	0.142**	10 (8)	0.400**	15 (15)
BHAR(+12) _p	0.132**	10 (5)	0.419**	15 (15)

(Continued on next page)

TABLE 2 (Continued)

Panel B: Mean Coefficients on Fundamental Signals (*t*-statistics in parentheses)^d

Dependent Variables	Independent Variables									
	Intercept	RINV	RAR	RCAPX	RGM	RS&A	RETR	EQ	AQ	RLF
BHAR(+6) _{it}	-0.031 (-1.578)	0.019 (2.063)*	-0.000 (-0.015)	-0.014 (-1.709)	0.012 (1.304)	0.015 (1.363)	0.001 (0.116)	0.002 (0.260)	0.019 (0.997)	0.010 (1.113)
BHAR(+12) _{it}	-0.078 (-2.225)‡	0.038 (2.372)*	0.020 (1.622)	-0.040 (-2.914)‡	0.024 (1.857)*	0.038 (2.069)*	-0.017 (-1.468)	0.022 (1.599)	0.036 (1.589)	0.011 (0.610)

* Significant at or below the 0.05 level using a one-tailed test.

** Significant at or below the 0.01 level using a one-tailed test.

‡ Mean coefficient is more than two standard deviations away from zero.

* BHAR(+m)_{it} is the m-month portfolio return, calculated from the sum of the estimated coefficients on the scaled decile ranks of the fundamental signals in the above regression. BHAR(+m)_{it} represents m-month buy-and-hold size-adjusted returns for firm *i* compounded from the fourth month after the end of fiscal year *t* (all firms have December fiscal year-ends). Size-adjusted returns are calculated by subtracting the buy-and-hold return on a portfolio of firms in the same size decile as a given firm (as of the beginning of the year) from the given firm's raw buy-and-hold return. R SIGNAL_{k, it} represents the scaled decile rank of signal *k*, *k* = 1 to 9, for firm *i* in year *t* (see table 1 for signal definitions). RCEPS_{it} (RBETA_{it}) is the scaled decile rank of the change in earnings (market-model beta) for firm *i* in year *t*.

^b The overall mean portfolio return is the average of the 15 yearly portfolio returns calculated from 1974 to 1988. Significance tests are based on a standard error calculated from the distribution of the individual yearly coefficients. The total sample size is 9,764 firm-years, with the yearly sample sizes ranging between 469 and 785.

^c This column gives the number of times the yearly portfolio return is positive. The number of times the yearly portfolio return is significantly greater than zero at or below the 0.10 level using a one-tailed *t*-test is given in parentheses.

^d The mean coefficient is calculated from 15 yearly regressions from 1974 to 1988. The *t*-statistic is calculated as the ratio of the mean coefficient to a standard error calculated from the distribution of the individual yearly coefficients.

portfolios reported in column 1, we see that the latter returns are roughly 30 percent of the former returns throughout the first year of the strategy.

Returns to the Individual Fundamental Signals

Panel B of table 2 reports the mean regression coefficients and t-statistics for the scaled decile rank values of the fundamental signals for 6- and 12-month intervals subsequent to the disclosure of the fundamental signals.¹¹ The mean coefficients of the RINV, RGM and RS&A signals are positive and significant after one year, the first reaching significance after six months of return cumulation. The results reported by AB support the hypothesis that these fundamental signals are related to *contemporaneous* returns as hypothesized over the sample period examined in this study. Therefore, the relations we observe between subsequent returns and these signals indicate a market underreaction to the information that begins to be resolved after the signals are disclosed and continues over the period that next year's earnings are revealed.

The sign of the mean RCAPX signal coefficient is negative and over two standard deviations from zero, opposite to what would be predicted based on analysts' pronouncements. We note that AB report that, over the same sample period, the RCAPX signal is also associated with contemporaneous returns and one-year-ahead earnings in directions opposite to what had been hypothesized. This evidence indicates that when the average firms' capital expenditures are above (below) an industry benchmark this actually represents bad (good) news. In view of this fact, the sign and magnitude of the RCAPX coefficient in the future returns regressions reported in table 2, panel B are consistent, once again, with market underreaction to the earnings information communicated by this variable.

Association Between the Abnormal Returns to the Fundamental Strategy and Future Earnings

AB report evidence that the fundamental signals' relation to contemporaneous returns can be partially attributed to their ability to predict one-year-ahead earnings, indicating market recognition of their forward-looking nature. If price corrections take place in response to the resolution of short-run earnings information that was predictable from the fundamental signals, a large share of abnormal returns to the strategy should be associated with one-year-ahead earnings changes. If abnormal returns are observed but not related to the revelation of earnings information, this would be inconsistent with the existence of temporary mispricing and suggest that other explanations, such as mismeasurement of firm risk, may be responsible for the apparent mispricing documented in table 2.¹²

In this section, we attempt to gauge how much of the future abnormal returns to the fundamental strategy reported in table 2 are associated with one-year-ahead earnings changes. Our approach requires a decomposition of the abnormal returns into two components. The first component represents the returns associated with actual one-year-ahead earnings changes. A relation between this component and the fundamental signals would be consistent with the existence of predictable price corrections based on the realization of short-term earnings. We calculate this component for each year/return cumulation interval by multiplying the scaled decile ranks of one-year-ahead earnings changes by the slope

¹¹ The t-tests are based on the ratio of the mean fundamental signal coefficients to a standard error calculated from the distribution of individual yearly coefficients. This test overcomes bias in standard errors caused by cross-sectional correlation among the observations within a year (see Bernard 1987).

¹² In subsequent robustness tests, we also attempt to distinguish mispricing from risk as an explanation for abnormal returns by examining three-day quarterly earnings announcement periods for unusual return concentrations and by examining abnormal returns to the strategy when holding positions through a second year.

coefficient estimated from equation (3). This yields one-year-ahead "earnings-based" firm abnormal returns for each year/return cumulation period combination, denoted $EBHAR(+m)_{i,t}$ (i.e., $EBHAR(+m)_{i,t} = \hat{\gamma}_2 \cdot RCEPS_{i,t+1}$). The difference between the firm's total abnormal returns and earnings-based returns for a given year/return cumulation period, denoted $OBHAR(+m)_{i,t}$, represents the abnormal returns to other factors (i.e., $OBHAR(+m)_{i,t} = BHAR(+m)_{i,t} - EBHAR(+m)_{i,t}$). A significant relation between these returns and the fundamental signals would be consistent with price corrections to the long-term earnings implications of the realization of short-term earnings or with evidence of the signals' ability to reflect shifts in risk and/or mismeasurement of expected returns.

Panel A of table 3 presents the decomposition of the average size-adjusted returns to the portfolio strategy for cumulation periods beginning four months after the signal values are realized. The total returns to the strategy reported earlier are included in column 1 to facilitate comparison. While the earnings-based abnormal return from the fundamental strategy rises over the year, it achieves a level of only 1.2 percent for the period over which the subsequent year's earnings are revealed to the market. Although 11 of 15 sample years produce positive earnings-based abnormal returns, only two are individually significant. Two of the four negative abnormal returns are significant.

The return directly associated with one-year-ahead earnings changes only represents approximately ten percent of the total abnormal return to the portfolios formed on the fundamental strategy. At first glance, this result appears less consistent with the strategy capturing price corrections associated with the revelation of short-term earnings than it is with the possibility that abnormal returns to the strategy are attributable to changes or misestimation of firm risk. However, this appearance is misleading based on the evidence in panel B of table 3. Here we present the individual coefficients from regressing the $EBHAR(+m)_{i,t}$ and $OBHAR(+m)_{i,t}$ components of total returns on the scaled decile ranks of the fundamental signals.

The key result in panel B of table 3 is that the RAR and RCAPX earnings-based returns are both negative and over two standard deviations from zero in the first year of the strategy. Given the findings of AB, who report that both signals are associated with contemporaneous returns and one-year-ahead earnings changes in the direction opposite to what was hypothesized, the results are consistent with underreaction to one-year-ahead-earnings news.¹³ However, because the strategy is implemented based on the hypothesized relations between these signals and earnings, these portfolios actually reduce the total return to the strategy and understate the percentage of the return that is associated with future earnings changes. In contrast, the RINV and RETR signals are reliably positive and increasing in each cumulation period of the first year of the strategy, consistent with findings in AB that both variables are positive predictors of one-year-ahead earnings changes. The results for these four variables strongly indicate underreaction to the information in the signals that is corrected as next year's earnings are revealed.

The RS&A and RGM signal portfolios also contribute significant abnormal returns to the strategy. Moreover, AB reports these signals are also associated with one-year-ahead earnings in the directions hypothesized. Thus, as in the cases of the RINV and RETR signals, we expected to find evidence of a significant earnings-based returns, indicating a

¹³ AB provides evidence from contextual analyses that the observed relation between CAPX and future earnings is driven by prior bad-news firms suggesting that firms that have fallen behind their industry competitors may be attempting to catch up with major acquisition programs. The observed relation between AR and future earnings is driven by prior and expected good-news firms which supports the "sales momentum hypothesis" that receivables balances indicate the level of sales for the last few weeks of a quarter and, hence, expected sales and earnings for the next year (Stober 1993).

TABLE 3
Mean Size-Adjusted Portfolio Returns to Fundamental Signal Strategy:
Total Portfolio Returns Decomposed into Returns Based on One-Year-Ahead Earnings and Returns Based on Other Factors

$$BHAR(+m)_{p,t} = \sum_{k=1}^9 \hat{\alpha}_p \text{ where } \hat{\alpha}_j \text{ is estimated from } BHAR(+m)_{j,t} = \alpha_0 + \sum_{k=1}^9 \alpha_j R SIGNAL_{k,t} + \alpha_{10} RBETA_{k,t} + \alpha_{11} RCEPS_{k,t} + e_{j,t}^a$$

Panel A: Mean Size-Adjusted Portfolio Returns to Strategy

Cumulation Period	Total Returns		Earnings-Based Returns ^b		Other Factor Returns ^b	
	Overall	Positive	Overall	Positive	Overall	Positive
	Mean ^c	Years ^d	Mean	Years	Mean	Years
BHAR(+1) _p	0.032**	10 (6)	0.001	11 (2)	0.032**	12 (7)
BHAR(+2) _p	0.011	10 (3)	-0.001	11 (2)	0.012	10 (3)
BHAR(+3) _p	0.017	10 (4)	0.001	11 (2)	0.016	10 (4)
BHAR(+4) _p	-0.006	8 (4)	0.004	11 (2)	-0.011	8 (4)
BHAR(+5) _p	0.032	10 (5)	0.006	11 (2)	0.025	10 (4)
BHAR(+6) _p	0.064	11 (7)	0.008	11 (2)	0.056	10 (7)
BHAR(+7) _p	0.063*	11 (5)	0.008	11 (2)	0.055*	11 (6)
BHAR(+8) _p	0.092**	11 (6)	0.013	11 (2)	0.079**	12 (6)
BHAR(+9) _p	0.132**	11 (9)	0.013	11 (2)	0.119**	11 (7)
BHAR(+10) _p	0.122**	10 (7)	0.013	11 (2)	0.110*	10 (6)
BHAR(+11) _p	0.142**	10 (8)	0.013	11 (2)	0.129*	10 (6)
BHAR(+12) _p	0.132**	10 (5)	0.012	11 (2)	0.119*	10 (5)

(Continued on next page)

TABLE 3 (Continued)

Panel B: Mean Coefficients on Fundamental Signals (*t*-statistics in parentheses)^a

Dependent Variables	Independent Variables									
	Intercept	RINV	RAR	RCAPX	RGM	RS&A	RETR	EQ	AQ	RLF
Earnings-Based Returns										
EBHAR(+6) _{it}	-0.123 (-10.803)‡	0.022 (6.958)*	-0.014 (-3.928)‡	-0.014 (-6.653)‡	-0.002 (-0.541)	-0.000 (-0.106)	0.008 (2.406)*	0.000 (0.053)	0.006 (1.498)	0.003 (1.153)
EBHAR(+12) _{it}	-0.222 (-8.888)‡	0.038 (7.051)*	-0.025 (-3.884)‡	-0.024 (-6.520)‡	-0.002 (-0.220)	0.000 (0.051)	0.012 (2.291)*	-0.001 (-0.165)	0.009 (1.298)	0.006 (1.293)
Other Factor Returns										
OBHAR(+6) _{it}	0.093 (4.090)‡	-0.003 (-0.327)	0.014 (1.928)*	-0.000 (-0.036)	0.014 (1.523)	0.016 (1.468)	-0.007 (-0.994)	0.002 (0.272)	0.013 (0.738)	0.007 (0.793)
OBHAR(+12) _{it}	0.144 (2.911)‡	0.000 (0.004)	0.045 (3.538)*	-0.017 (-1.179)	0.026 (1.794)*	0.038 (1.776)*	-0.029 (-2.209)‡	0.023 (1.873)*	0.027 (1.232)	0.005 (0.286)

* Significant at or below the 0.05 level using a one-tailed test.

** Significant at or below the 0.01 level using a one-tailed test.

‡ Mean coefficient is more than two standard deviations away from zero.

* See table 2 for definitions of variables in the regression.

^b Total returns for each firm are split into the portion of returns due to one-year-ahead earnings ("earnings-based returns") and the portion of returns due to other factors ("other factor returns") in the following manner. Total returns are regressed on the scaled decile rank of one-year-ahead earnings changes, and the estimated coefficient is multiplied by the scaled decile rank of those earnings changes for each firm *i* to yield the earnings-based returns (EBHAR(+m)_{it}). The remaining portion of returns, which includes the intercept and the firm-specific error term from the regression, is denoted as the returns due to other factors (OBHAR(+m)_{it}).

^c The overall mean portfolio return is the average of the 15 yearly portfolio returns calculated from 1974 to 1988. Significance tests are based on a standard error calculated from the distribution of the individual yearly coefficients. The total sample size is 9,764 firm-years, with the yearly sample sizes ranging between 469 and 785.

^d This column gives the number of times the yearly portfolio return is positive. The number of times the yearly portfolio return is significantly greater than zero at or below the 0.10 level using a one-tailed *t*-test is given in parentheses.

^e The mean coefficient is calculated from 15 yearly regressions from 1974 to 1988. The *t*-statistic is calculated as the ratio of the mean coefficient to a standard error calculated from the distribution of the individual yearly coefficients.

price correction coinciding with the revelation of next year's earnings. Surprisingly, this result was not observed. Instead the abnormal returns to these signal portfolios appear to be driven by other-factor returns suggesting that these signals reflect "unaccounted for risk" or information about multiple-year ahead earnings.¹⁴

Table 4 restates the total, earnings-based and other factor returns generated from portfolio positions taken for each fundamental signal based on its *observed* average relation to future earnings rather than the relation subscribed to by analysts (i.e., the signs on the RCAPX and RAR signals are reversed). Total returns increase to 17.2 percent and are positive (significant) in 12 (7) of 15 years after 12 months of cumulation under this alternative strategy, with no instances of significant negative returns in the years the strategy failed.

Clearly, reliance on the average relations between the fundamental signals and future earnings over the sample period introduces hindsight bias into the alternative strategy, implying that the strategy was not implementable.¹⁵ We stress, however, that the primary purpose of this step in the analysis was to shed light on the nature and timeliness of information conveyed to the market through the fundamental signals. This point is highlighted in columns 2 and 3 of table 4 which restate the results of the decomposition test when returns to the fundamental strategy are determined based on the actual sign of the average relations between the fundamental signals and future earnings. Earnings-based returns are positive in 14 of 15 years for all cumulation periods in the first year and are significant in 13 years. Depending on the cumulation period considered, the abnormal return to the other factor component is positive in the range of eight to 12 years and significant in approximately one-half the cases.

Basing the strategy on the signals' observed average relation to future earnings leads to a substantial increase in the relative percentage of the total return attributable to one-year-ahead earnings. In fact, earnings-based returns account for 65 percent of the total returns to the portfolio strategy after 12 months, suggesting that most of the underreaction to the accounting information is associated with one-year-ahead earnings changes. While some of this explanatory power may also be a reflection of the signals' correlation with risk changes and/or misestimation of expected returns, it is difficult to understand why this association would not have a similar impact on other factor returns which, in principle, should capture persistent effects applicable to subsequent years.

¹⁴ Potential explanations for the lack of significance of the earnings-based returns to these signals are that the empirical representations of the economic reasoning underlying the GM and S&A signals are not specified in a manner that would capture the earnings information contained in them, or that the market impounds all of the one-year-ahead information in these signals. Because there appears to be very little slippage between the underlying economic reasoning behind the GM and S&A signals and their empirical representation, we doubt the descriptive validity of the first explanation. The second explanation appears to be more plausible though it requires the market to be efficient with respect to the one-year-ahead earnings information in the GM and S&A signals, but not the INV, ETR, CAPX and AR signals. The market may efficiently process the information in one signal but not in another because of differential complexity involved in extracting the information in the signal. For example, Plumlee (1997) indicates that the level of complexity in calculating the effective tax rate impacts the magnitude of analysts' tax rate and earnings forecast errors.

¹⁵ Another strategy we analyzed eliminates the need to know the signals' average relation over the entire sample period before forming portfolios. The strategy is executed by forming portfolios every year based on the sign of each fundamental signal's relation to *contemporaneous* returns. Like the original strategy, this one exploits the potential for underreaction by assuming that whatever the market's initial response to the signals, it did not completely impound the information into contemporaneous returns, implying positions analogous to those taken in post-earnings-announcement drift strategies. This strategy yields very similar results to those just described for the alternative strategy.

TABLE 4
Mean Size-Adjusted Portfolio Returns to Alternative Fundamental Signal Strategy*
Total Portfolio Returns Decomposed into Returns Based on One-Year-Ahead Earnings
and Returns Based on Other Factors

$$BHAR(+m)_{p,t} = \sum_{k=1}^g \hat{\alpha}_k \text{ where } \hat{\alpha}_k \text{ is estimated from}$$

$$BHAR(+m)_{i,t} = \alpha_0 + \sum_{k=1}^g \alpha_k RSIGNAL_{k,i,t} + \alpha_{10} RBETA_{i,t} \\ + \alpha_{11} RCEPS_{i,t} + e_{i,t}^b$$

Alternative Fundamental Signal Strategy

Cumulation Period	Total Returns		Earnings Based Returns ^c		Other Factor Returns ^c	
	Overall Mean ^d	Positive Years ^e	Overall Mean	Positive Years	Overall Mean	Positive Years
BHAR (+1) _p	0.052**	14 (7)	0.015**	14 (13)	0.037**	12 (7)
BHAR (+2) _p	0.043*	11 (7)	0.023**	14 (13)	0.020	10 (3)
BHAR (+3) _p	0.047	11 (5)	0.034**	14 (13)	0.013	10 (4)
BHAR (+4) _p	0.034	10 (7)	0.049**	14 (13)	-0.015	8 (4)
BHAR (+5) _p	0.074*	12 (8)	0.055**	14 (13)	0.018	10 (4)
BHAR (+6) _p	0.092*	12 (9)	0.063**	14 (13)	0.029	10 (7)
BHAR (+7) _p	0.106**	13 (8)	0.073**	14 (13)	0.033	11 (6)
BHAR (+8) _p	0.147**	14 (8)	0.090**	14 (13)	0.057*	12 (6)
BHAR (+9) _p	0.181**	14 (9)	0.095**	14 (13)	0.086**	11 (7)
BHAR (+10) _p	0.170**	12 (6)	0.100**	14 (13)	0.070	10 (6)
BHAR (+11) _p	0.195**	13 (9)	0.108**	14 (13)	0.087*	10 (6)
BHAR (+12) _p	0.172**	12 (7)	0.110**	14 (13)	0.062	10 (5)

* Significant at or below the 0.05 level using a one-tailed test.

** Significant at or below the 0.01 level using a one-tailed test.

^a The alternative strategy treats the RAR and RCAPX coefficients as if their hypothesized sign is *negative* based on their observed association with one-year-ahead earnings during 1974 to 1988.

^b See table 2 for definitions of variables in the regression.

^c See table 3 for the definitions of earnings-based returns and other factor returns.

^d The overall mean portfolio return is the average of the 15 yearly portfolio returns calculated from 1974 to 1988. Significance tests are based on a standard error calculated from the distribution of the individual yearly coefficients. The total sample size is 9,764 firm-years, with the yearly sample sizes ranging between 469 and 785.

^e This column gives the number of times the yearly portfolio return is positive. The number of times the yearly portfolio return is significantly greater than zero at or below the 0.10 level using a one-tailed t-test is given in parentheses.

V. SUPPLEMENTAL TESTS

Risk vs. Mispricing as an Explanation for Abnormal Returns

Persistence of Abnormal Returns

Stober (1992) reports that abnormal returns to the Ou and Penman (1989a) strategy continue to increase up to 72 months following the earnings announcement date and infers that their predictors measure risk shifts. The persistence of significant abnormal returns should not be used as the sole criterion for discerning whether the signals identify mispricing or shifts in firm risk because it is possible for subsequent returns to reflect both effects. However, the absence of persistent returns does argue against risk as a complete

explanation for pricing anomalies. We test for persistence of abnormal returns by reinvesting funds after 12 months in the firms that remain in our sample at the end of the year and cumulating returns through a second 12-month period.

Unreported results indicate that returns to maintaining positions in the strategy for a second year are economically inconsequential. This evidence indicates that abnormal returns do not persist beyond one year from the inception of the strategy. A third year of the strategy also produces no reliable evidence of abnormal returns. The same conclusion is drawn from the returns to the alternative strategy after a second and third year of execution.

Abnormal Returns to the Fundamental Strategy Around Earnings Announcements

If the results reported thus far represent evidence of mispricing based on market underreaction to detailed accounting information that predicts future earnings, then it is reasonable to expect that a disproportionate share of the abnormal returns will be concentrated around information events concerning the realization of future earnings. These events include newspaper stories, analyst and management forecasts, information transfers from competitors, and actual earnings announcements. We limited our search for concentrated abnormal returns to the four three-day periods surrounding quarterly earnings announcements in the first year of the strategy. Each three-day announcement period begins two trading days prior to the Compustat announcement date. Announcement period abnormal returns for a given quarter are calculated as three-day buy-and-hold size-adjusted returns surrounding an earnings announcement.

The results for the alternative strategy (i.e., where positions have been taken based on the signals' observed empirical relation with future earnings) are presented in column 1 of table 5. Each successive quarterly announcement period return is added to the sum of all previous announcement returns. The cumulative abnormal return for the announcement period is greatest after the third quarter earnings announcement, reaching a level of approximately 2.5 percent. This represents approximately 14 percent (three times the expected percentage) of the total abnormal return to the alternative strategy through the third quarter of the fiscal year and 26 percent of the earnings-based return cumulated to that point (see table 4). By way of comparison, the announcement period cumulative abnormal return to a perfect foresight strategy is 6.8 percent at the end of the third quarter (column 2 of table 5). Surprisingly, the announcement period cumulative return declines in the fourth quarter (inconsistent with similarly calculated returns for perfect foresight strategy).¹⁶

The evidence of announcement period returns, in addition to the evidence related to the alternative strategy in table 4, supports the interpretation that abnormal returns to the fundamental strategy described in the paper are the result of price corrections of initial underreactions to detailed accounting information about one-year-ahead earnings. While a failure to properly measure near-term risk faced by the firm might explain some of the abnormal returns observed in table 2, there is no obvious risk-based explanation that accounts for the concentration of abnormal returns around earnings announcements.

Controlling for the Fama and French Risk Factors

Prior research has demonstrated that future abnormal returns are associated with other variables, among them firm size and the book-to-market ratio. It has been conjectured that

¹⁶ It is possible that some of the signals have time-series properties similar to quarterly earnings, and that this result reflects the pattern of post-earnings announcement drift reported in Bernard and Thomas (1990). However, Raedy (1997) demonstrates that our strategy neither subsumes, nor is subsumed by, a post-earnings-announcement drift strategy, making it less likely that the results in table 5 are due to the signals proxying for post-earnings-announcement drift.

TABLE 5
Mean Size-Adjusted Portfolio Returns to Alternative Fundamental Signal Strategy and to Perfect Foresight Strategy Around Quarterly Earnings Announcements^a

Fundamental Signal Strategy:

$$BHAR(Q + q)_{p,t} = \sum_{k=1}^9 \hat{\alpha}_k \text{ where } \hat{\alpha}_k \text{ is estimated from}$$

$$BHAR(Q + q)_{i,t} = \alpha_0 + \sum_{k=1}^9 \alpha_k RSIGNAL_{k,i,t} + \alpha_{10} RBETA_{i,t} + \alpha_{11} RCEPS_{i,t} + e_{i,t}^b$$

Perfect Foresight Strategy:

$$BHAR(Q + q)_{p,t} = \hat{\gamma}_2 \text{ where } \hat{\gamma}_2 \text{ is estimated from}$$

$$BHAR(+m)_{i,t} = \gamma_0 + \gamma_1 RBETA_{i,t} + \gamma_2 RCEPS_{i,t+1} + e_{i,t}$$

Cumulation Period	Alternative Fundamental Signal Strategy		Perfect Foresight Strategy	
	Total Returns		Total Returns	
	Overall Mean ^c	Positive Years ^d	Overall Mean	Positive Years
BHAR(Q + 1) _p	0.017**	13 (4)	0.023**	15 (15)
BHAR(Q + 2) _p	0.019**	11 (4)	0.047**	15 (15)
BHAR(Q + 3) _p	0.025**	10 (6)	0.068**	15 (15)
BHAR(Q + 4) _p	0.014	8 (3)	0.088**	15 (15)

* Significant at or below the 0.05 level using a one-tailed test.

** Significant at or below the 0.01 level using a one-tailed test.

^a The alternative strategy treats the RAR and RCAPX coefficients as if their hypothesized sign is *negative* based on their observed association with one-year-ahead earnings during 1974–1988.

^b $BHAR(Q + q)_{p,t}$ is the portfolio return over q three-day quarterly earnings announcement periods subsequent to year t , calculated from the sum of the estimated coefficients on the scaled decile ranks of the fundamental signals in the above regression. $BHAR(Q + q)_{i,t}$ represents buy-and-hold size-adjusted returns over each three-day period around the quarterly earnings announcements prior to and including quarter q for firm i subsequent to year t . Each three-day period begins two days prior to the earnings announcement date and ends on the earnings announcement date, as reported by Compustat. Size-adjusted returns are calculated by subtracting the buy-and-hold return on a portfolio of firms in the same size decile as a given firm (as of the beginning of the year) from the given firm's raw buy-and-hold return. Other variables in the regression are defined in table 2.

^c The overall mean portfolio return is the average of the 15 yearly portfolio returns calculated from 1974 to 1988. Significance tests are based on a standard error calculated from the distribution of the individual yearly coefficients. The total sample size is 9,764 firm-years, with the yearly sample sizes ranging between 469 and 785.

^d This column gives the number of times the yearly portfolio return is positive. The number of times the yearly portfolio return is significantly greater than zero at or below the 0.10 level using a one-tailed t-test is given in parentheses.

these variables, along with beta, reflect unknown risk factors and hence, are associated with future expected returns (Fama and French 1992). It is possible that the fundamental signals are related to these other variables and, in turn, the returns to the fundamental strategy are not independent of the returns observed in connection with the Fama and French (1992) variables. To determine if the returns to the fundamental strategy are distinct from those

generated in prior studies, we added firm-size and book-to-market variables to the RHS of equation (1) and reran the tests summarized in tables 2 and 4.¹⁷

The size variable produced a significant average coefficient over the sample period and the book-to-market variable did not (not reported in tables).¹⁸ However, the inclusion of both variables did not materially affect the magnitude of the fundamental signal coefficients, indicating that the abnormal returns to the fundamental strategy are distinct from those generated by variables associated with previous pricing anomalies.¹⁹

Relation to an Accrual Accounting-Based Anomaly

Our work is also related to Sloan (1996). He conjectures that investors underutilize the information about future earnings embedded in accounting accruals and shows that a strategy designed to exploit information in accruals can generate significant abnormal returns. We constructed an abnormal accrual variable similar to Sloan's and employed it in our regressions, which also control for beta and the change in earnings in forming portfolios. The results confirm Sloan's (1996) findings as the strategy yields a 12-month abnormal return of 7.5 percent, compared to the 10.4 percent he reports.²⁰ We also decomposed the total abnormal returns to portfolios formed on this variable into a one-year-ahead earnings-based and other factor components. Similar to the results we report in table 4, approximately 60 percent of the return to Sloan's (1996) accrual strategy is related to one-year-ahead-earnings. Nevertheless, when we re-estimate equation (1) including Sloan's (1996) abnormal accrual variable on the RHS, both the fundamental signals and abnormal accrual variable generate significant abnormal returns (not reported in tables).²¹

Exploitability of Mispricing

Impact of Institutional Constraints

It is axiomatic that the magnitude of returns to fundamental strategies earned on paper is greater than what can be achieved in practice. A number of market factors militate against exploitation of mispricing. One factor is restrictions on short sales. To the extent that our strategy identifies negative weights for securities not held at the beginning of the year, short selling is implied. As a rough measure of the impact of short sale restrictions, we summed the weighted returns of securities with positive weights (i.e., buys) and found that these

¹⁷ The book-to-market variable was based on stock price and book value per share on the first day of the first fiscal year over which abnormal returns were calculated. Firm size was calculated as the market value of equity as of that date. As in the case of the fundamental signals, scaled decile ranks of these variables were used in the regression tests.

¹⁸ These results are consistent with our findings when the fundamental signals are excluded from the regressions as well. The absence of the book-to-market effect in our data is partially attributable to the time period we are considering, as the magnitude of this effect becomes substantially attenuated starting in the mid- to late-1980s. However, the use of size-adjusted returns on the LHS of the regressions is the most important factor behind the failure to observe the anticipated relations.

¹⁹ The robustness of the returns to the fundamental strategy after controlling for a number of well-known pricing anomalies is confirmed in an exhaustive study conducted by Raedy (1997).

²⁰ The mean return to accrual variable strategy is 9.2 percent when, following Sloan's (1996) approach, we do not restrict our sample to December fiscal year-end firms.

²¹ To explore why both variables generate abnormal returns, we decomposed the accrual variable into current asset, depreciation and current liability components as in equation (1) of Sloan (1996). The results reveal that the first two components generate marginal and insignificant abnormal returns, respectively. In contrast, the current liability component of the accrual variable generates a strongly significant abnormal return. The strength of this latter variable's association with returns combined with the absence of current liabilities in the calculation of the fundamental signals supports the notion that different phenomenon drive abnormal returns in the two studies.

securities contributed 57 percent (70 percent) of the returns to the original (alternative) strategy.²²

Another factor that effects the ability to earn abnormal returns is the impact of price pressure from trading. The problem is most pronounced for trading in small firms where large trades by investors may have a substantial effect on bid-ask spreads and, hence, the ability to actually exploit mispricing. To address this issue, we repeated the steps of our strategy after first limiting our sample to firms in the three top size (market value of equity) deciles of the NYSE/AMEX population. For these firms, the strategy produces an abnormal return of 8.4 percent (14.2 percent) or approximately 75 percent (80 percent) of the total generated by the original (alternative) strategy.

Extreme Portfolio Positions

A potential trading obstacle to earning abnormal returns could arise if our trading strategy required large portions of an investor's wealth to be committed to a small number of securities, a condition unacceptable to most professional portfolio managers and a likely proxy for an uncontrolled risk in a research design. To check for this possibility, we summed the weights across all nine fundamental portfolios for each firm and examined the net positions. The strategy required no net positions in a firm greater than 0.6 percent of total wealth. As it turns out, our strategy produces less extreme net positions than those implied by hedging the equally weighted observations in the top and bottom deciles of individual signal portfolios.

Transactions Costs

The buy-hold element of the fundamental strategy requires no more than a single trade in a given security in each year. Though nine "separate" portfolios—one for each signal—are formed, this feature of the strategy does not increase the number of trades to be implemented. Because portfolio weights are determined *ex ante* for each portfolio, the positions in the same firm across all nine portfolios can be netted, requiring a single trade to achieve the optimal weights in all portfolios. Though not exploited in our approach, existing portfolio positions could allow for some securities to be sold rather than shorted and others to be rolled over rather than purchased, further reducing transactions costs. As a practical matter, the majority of securities receive zero or negligible weights in the strategy, implying a very small potential impact on portfolio returns if positions in these firms were avoided to minimize trading costs.²³ Based on the combined costs of bid-ask spreads and commissions, Stoll and Whaley (1983) estimate average trading costs for small and large firm stocks at approximately four percent and two percent, respectively. The implementation of our strategy on a holdout sample described below limits trading to only firms in the top three size deciles, implying transactions costs should be at the low end of this range.

The analysis of firms with positive and negative weights in the portfolios also shows that long/hold positions produce a greater percentage of abnormal returns reported in tables 2 and 3 than sale/short-sale positions. If transactions costs were greater for short-sale firms,

²² Some of these buys would be financed through the sale of securities already held and some would represent holds on securities in the portfolio at the start of the year. If remaining buys could not be financed through short sales, the strategy would no longer be zero-investment. These results are reported simply to show the potential to earn returns on the buy-side of the portfolio strategy, not as an indication of the actual return that could be earned.

²³ As indicated earlier, our results were similar following a strategy in which hedge portfolios were formed by subtracting the average return from buying securities in the highest decile of the distributions of each fundamental signal from the return earned by selling securities in the lowest decile of the distribution of each fundamental signal. This approach requires a small fraction of the trades required in the approach just described.

we would have expected the opposite result to hold, reflecting compensation for trading restrictions. Overall, the transactions costs required to exploit underreactions to the information in the fundamental signals appear to be well below the returns achieved.

Exploitability of the Strategy in a Holdout Sample

We attempt to ameliorate effects of hindsight bias in the identification of the signals by carrying out our strategy on a holdout sample covering the period 1989–1993. This period does not overlap with that examined by LT and did not influence their definitions of the fundamental signals. To simulate an actual investment setting in which the number of different fundamental strategies employed would likely be limited, we commit to a simple preset program that simultaneously exploits (1) the observed empirical relations between the fundamental signals and future returns over the period 1974–1988, (2) firm-specific contextual information based on prior and expected earnings news as reported by AB, and (3) trading only in firms in the largest three NYSE/AMEX size deciles.²⁴ The first two elements of this program attempt to take advantage of the observed relations between the signals and both future earnings and returns reported earlier and in AB.²⁵ The third element attempts to ensure that any abnormal returns from the strategy are actually exploitable by avoiding potential complications from price pressure and unidentified risks associated with trading in small firms.

Table 6 presents results for the four “contextual” strategies implied by the preset program. Column 1 presents returns to the strategy achieved by limiting the sample to firms that experienced “bad” prior earnings news, where bad news is defined as a negative prior year earnings change. Based on results from contextual analyses over the 1974–1988 period, this strategy establishes positions in the RINV, RGM, RS&A, RETR and EQ variables consistent with the original, hypothesized strategy, takes positions opposite to those originally hypothesized for RCAPX, and takes no positions in the RAR, AQ and RLF variables. Column 2 presents returns when only “good” prior earnings news firms are considered. Based on contextual analyses between 1974 and 1988, the strategy employs RINV and RETR in the manner originally hypothesized but takes positions opposite to those originally hypothesized for the RAR variable.²⁶ Portfolios are not established for the remaining signals.

The average returns to the bad prior earnings news strategy are steadily increasing, leveling off at an impressive 31 percent after 12 months. The mean return is reliably positive after the seventh month of the strategy. Five (three) of five years produce a positive (significant) return after 12 months. The average size-adjusted return for the good prior earnings news strategy was a statistically insignificant negative 6 percent. The only significant return

²⁴ To the extent that the implementation of our strategy for the holdout sample exploits the observed empirical association between the AR and CAPX signals and one-year-ahead earnings, our approach suffers from the potential shortcomings of “letting the data speak” identified earlier in Ou and Penman’s (1989a) approach. The problem is somewhat mitigated by the fact that the length of the sample period over which these relations are estimated is over three times the length examined in either of Ou and Penman’s (1989a) estimation periods. More important, additional contextual analysis performed in AB provides explanations for observed relations between the signals and future earnings in directions opposite to what had been hypothesized by LT, lending additional conceptual support for refinements to the strategy.

²⁵ We limit the contextual element of the program to the prior earnings news and future earnings news (historical P/E) firm-specific variables in large part for simplicity in the execution and evaluation of the strategy. We do not attempt to exploit the macroeconomic contextual variables of inflation and GDP explored by AB as this would force us to rely on forecasts of these variables, likely adding substantial noise to the process. Although some results from AB’s analysis suggests the possibility that industry membership might be exploited in our strategy, we do not pursue this path so as to avoid the potential criticism that observed abnormal returns capture payoffs to inadvertent sector bets over our short hold-out period.

²⁶ Our treatment of the RAR and RCAPX variables for these contextual strategies is also consistent with these variables’ relations to future earnings as reported in AB.

TABLE 6
Mean Size-Adjusted Portfolio Returns to Contextual Fundamental Signal Strategies Using Only Large Firms in a 1989 to 1993 Holdout Sample

$$BHAR(+m)_{p,t} = \sum_{k=1}^9 \hat{\alpha}_k \text{ where } \hat{\alpha}_j \text{ is estimated from } BHAR(+m)_{i,t} = \alpha_0 + \sum_{k=1}^9 \alpha_k RSIGNAL_{k,i,t} + \alpha_{10} RBETA_{i,t} + \alpha_{11} RCEPS_{i,t} + e_{i,t}^a$$

Cumulation Period	Bad News Firms ^b			Good News Firms ^b			Low P/E Firms ^b			High P/E Firms ^b			Original Strategy ^c		
	Overall Mean ^d	Positive Years ^e		Overall Mean	Positive Years		Overall Mean	Positive Years		Overall Mean	Positive Years		Overall Mean	Positive Years	
BHAR(+1) _p	0.062**	5 (1)		0.029	4 (2)		0.036*	5 (1)		0.008	2 (0)		0.032*	4 (1)	
BHAR(+2) _p	0.028	2 (1)		-0.008	2 (1)		-0.027	1 (0)		0.004	3 (0)		0.029	2 (1)	
BHAR(+3) _p	0.068	4 (2)		0.001	3 (2)		-0.009	3 (0)		0.019	2 (1)		0.024	3 (1)	
BHAR(+4) _p	0.102	4 (3)		0.031	3 (2)		0.031	3 (1)		0.075	4 (2)		0.063	3 (2)	
BHAR(+5) _p	0.118	3 (3)		0.022	3 (1)		0.011	3 (0)		0.112	4 (2)		0.084	3 (3)	
BHAR(+6) _p	0.097	3 (2)		0.025	3 (2)		-0.016	3 (1)		0.110	3 (2)		0.109	3 (3)	
BHAR(+7) _p	0.127	3 (3)		0.003	2 (1)		-0.027	2 (0)		0.088	4 (1)		0.135*	4 (3)	
BHAR(+8) _p	0.174*	5 (2)		0.006	3 (0)		0.013	3 (0)		0.091	4 (1)		0.135*	4 (3)	
BHAR(+9) _p	0.219*	5 (2)		-0.002	2 (0)		0.011	3 (1)		0.091	3 (1)		0.144*	4 (3)	
BHAR(+10) _p	0.239*	5 (2)		-0.019	1 (0)		0.005	3 (1)		0.099	4 (1)		0.111	4 (2)	
BHAR(+11) _p	0.270*	5 (3)		-0.044	1 (0)		0.033	3 (1)		0.112*	4 (1)		0.129	4 (2)	
BHAR(+12) _p	0.312*	5 (3)		-0.062	1 (0)		0.020	3 (1)		0.083	3 (0)		0.132	4 (2)	

* Significant at or below the 0.05 level using a one-tailed test.

** Significant at or below the 0.01 level using a one-tailed test.

^a See table 2 for definitions of variables in the regression.

^b The contextual strategies treat the fundamental signal coefficients as if their hypothesized sign is based on their observed association with one-year-ahead earnings during 1974-1988, as summarized in the following table:

	RINV	RAR	RCAPX	RGM	RSGA	RETR	EQ	AQ	RLF	Sample Size
Bad news firms	+	-	-	+	+	+	+			920
Good news firms	+	-	-			+				1168
Low P/E firms	+	-	-			+				789
High P/E firms	+	-	-	+	+	+				1299

The table also includes respective sample sizes. The strategies are only executed on large firms, defined as firms in the top three size deciles in the CRSP database.

^c The original strategy uses the original hypothesized relations (i.e., all relations expected to be positive), as in table 2. This strategy is only executed on firms in the top three deciles of the CRSP database, resulting in a sample size of 2,088.

^d The overall mean portfolio return is the average of the five yearly portfolio returns calculated from 1989 to 1993. Significance tests are based on a standard error calculated from the distribution of the individual yearly coefficients.

^e This column gives the number of times the yearly portfolio return is positive. The number of times the yearly portfolio return is significantly greater than zero at or below the 0.10 level using a one-tailed t-test is given in parentheses.

to the good news strategy in the five years was a negative 33 percent in 1990. Assuming equal investment in each strategy, the combined good news/bad news strategy yields a positive abnormal return in each year after 12 months, with two of those years achieving significant returns individually.

Column 3 presents results for the low P/E (low expected earnings growth) context. The mean return to the strategy for this context is two percent over five years. Only three (one) of the five years produce a positive (significant) return. The negative returns in the other two years are not reliably different from zero. Column 4 reports the results for the high P/E strategy. The mean return reaches a level of 11 percent before leveling off at 8.3 percent after 12 months. The same three years that produce a positive return in the low P/E strategy also produce positive returns for this context.

Column 5 presents the returns had we chosen to bypass the contextual analysis elements of the strategy and had taken positions based on the originally hypothesized relations (but still only invested in large firms). Mean returns to this strategy would have increased to a high of 14 percent after nine months and settled at 13.2 percent (significant at the .06 level with four degrees of freedom) after 12 months. Four (two) of five years would have produced a positive (significant) return. Thus, even had we chosen to ignore information about the individual signals' relations to future earnings over 1974 to 1988 in various contexts, it appears that abnormal profits could still have been earned.

VI. SUMMARY AND CONCLUSIONS

In this paper, we present evidence that accounting-based signals defined to reflect familiar concepts of fundamental analysis can be used to predict future abnormal returns. Among the collection of signals we examine, relative changes in inventories, capital expenditures and effective tax rates appear to be particularly strong indicators of one-year-ahead earnings information to which the market underreacts. The signals pertaining to changes in gross margin and selling expenses also appear to capture information underused by the market about earnings beyond one year and/or risk.

The finding that abnormal returns to the fundamental strategy are associated with one-year-ahead earnings changes is consistent with prior work by Ou and Penman (1989a). However, unlike Ou and Penman (1989a), the explanatory variables selected for our fundamental strategy are directly motivated by economic arguments posited by practicing financial analysts. Thus, they provide a basis for furthering our knowledge of the relation between the output of accounting systems, future earnings and stock prices. This is highlighted by our ability to identify individual signals' contribution to the success of the fundamental strategy, a fact which would be obscured by relying on summary measures of accounting predictors or on aggregate earnings to generate returns.

Prior studies have suggested the possibility that so-called fundamental strategies actually identify changes in firm risk or misestimation of expected returns. It is possible that risk shifts may ultimately be shown to explain a large part of the success of fundamental strategies. Our results show: (1) a large percentage of the abnormal returns to the fundamental strategy outlined in this paper can be attributed to one-year-ahead earnings news, (2) there is an unusual concentration of abnormal returns around subsequent earnings announcements, (3) cumulative returns to the fundamental strategy level off after one year of the signals' disclosure, and (4) the returns to the strategy do not appear to be closely related to abnormal returns associated with book-to-market or firm-size variables. These findings argue against risk as a complete explanation for the abnormal returns we observe. Furthermore, though care must be exercised when interpreting the results from relatively short sample periods, a strategy that was based on the signals' relations to future earnings produces positive 12-month size-adjusted returns in 12 of 15 years and insignificant negative

returns in the remaining years. Thus, the consistent profitability of the alternative fundamental strategy makes it less plausible the high mean returns could be explained as a premium for risk.

The fact that large firms, less susceptible to price pressure from trading, account for a sizable portion of the abnormal return to the strategy and that short-sale restrictions would not appear to preclude the strategy's ability to earn profits, suggest potential mispricing is exploitable. Though only a short, five-year holdout sample period was examined, the results from application of a refined version of the fundamental strategy indicate the potential for patient investors to profit from market underreaction to the future earnings information captured in the signals.

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The Effects of Accounting Knowledge and Context on the Omission of Opportunity Costs in Resource Allocation Decisions

Sandra C. Vera-Muñoz
University of Notre Dame

ABSTRACT: Economic theory stresses that opportunity costs are relevant to resource allocation decisions, while prior empirical accounting research finds that decision makers tend to ignore or underweight opportunity cost information. This study examines whether accounting knowledge is associated with a decision maker's tendency to ignore opportunity costs in business decisions. The experiment's results indicate that the number of opportunity costs ignored by subjects in a business resource allocation decision is greater for subjects with high-accounting knowledge than for subjects with low-accounting knowledge. The experiment also indicates that subjects with high-accounting knowledge ignore a greater number of opportunity costs when the decision is posed in a business context than when it is posed in a personal context.

Key Words: *Opportunity costs, Knowledge structures, Accounting knowledge, Decision context.*

Data Availability: *Contact the author.*

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I. INTRODUCTION

ECONOMIC theory stresses that opportunity costs are relevant to resource allocation decisions (Solomons 1966; Coase 1981, 108; Zimmerman 1995, 24), while prior empirical accounting research reports that decision makers tend to ignore or underweight opportunity cost information (Becker et al. 1974; Neumann and Friedman 1978; Friedman and Neumann 1980; Hoskin 1983; Northcraft and Neale 1986). The reasons why decision makers ignore or underweight opportunity costs are not well understood. The goals of this study are to develop and test predictions about the tendency of decision makers to leave opportunity costs out of their analysis of a particular problem, and, in the end, to help decision makers improve the quality of their decisions. This study relies on Holland et al.'s (1986) theoretical framework of cognitive processing to examine whether decision context and the level of accounting knowledge affect a decision maker's consideration of opportunity costs.

Holland et al. (1986) and others (Hayes-Roth et al. 1983; Anzai and Yokoyama 1984; Glaser 1984) suggest that people have knowledge structures stored in memory that guide their problem solving. One implication of the research in knowledge structures is that people with high knowledge in one area will recall a familiar knowledge structure whenever it appears appropriate for a given decision context. I maintain that accounting knowledge structures do not ordinarily emphasize the relevance of opportunity costs. Consequently, I hypothesize that decision makers with high-accounting knowledge will have a greater tendency to ignore opportunity costs in business contexts than decision makers with low-accounting knowledge because the former group of decision makers will recall accounting knowledge structures which do not place an emphasis on such costs. However, I predict that decision makers with high-accounting knowledge will not have a tendency to ignore opportunity costs in personal decision contexts because such contexts will not usually trigger the application of their accounting knowledge.

The joint influence of accounting knowledge and decision context on the consideration of opportunity costs was examined in a between-subjects laboratory experiment. In the reported experiment, accounting knowledge was measured in two ways: discretely and continuously. The discrete measure classified subjects into high- and low-accounting knowledge categories based upon the program of graduate business study in which the subjects were enrolled. The continuous measure was the number of accounting courses the subjects had completed. Decision context was a manipulated variable. Subjects were presented with a resource allocation decision in either a business or a personal context. Subjects assumed the role of a financial consultant asked by a partner to recommend a resource allocation for a new client. The business and personal resource allocation cases were structurally equivalent. The experimental design randomized context treatments and controlled for the potential effect of analytical ability on performance.

The experiment produced the counter-intuitive result that high-accounting knowledge *interferes* with a decision maker's ability to incorporate opportunity costs into a business decision, but such knowledge does not interfere with a decision maker's ability to factor opportunity costs into a personal decision.¹ In particular, the results indicate that the number

¹ The word "interferes" as used in this study should not be confused with the psychological theory of interference, which provides an explanation for why forgetting occurs. According to interference theory, *new* information interferes with the recall of *old* knowledge structures from memory, and therefore, forgetting occurs as a result of a weakening of a stimulus-response association by learning of another association (Massaro 1975, 542-543). In contrast, the knowledge structures-guided explanation of why opportunity costs are ignored by subjects with high-accounting knowledge posits that recall of *existing* knowledge structures from memory interferes with information processing of external cues (i.e., *new* information). For an application of interference theory in the accounting context, see Moser (1989) and Frederick (1986).

of opportunity costs ignored by subjects increases significantly with increases in the subjects' accounting knowledge when the case is posed in a business context. In contrast, when the case is posed in a personal context, there is no relation between the number of opportunity costs ignored and subjects' accounting knowledge. Validity tests rule out differential knowledge about the opportunity cost concept by high- and low-accounting knowledge subjects as an alternative explanation of their average tendencies to ignore opportunity costs. Also, *ex post* analyses show that the experiment's findings are robust to differences in the subjects' maximization objective for the resource allocation task.

This study extends prior research in several ways. First, except for Hoskin (1983), prior accounting studies make no formal attempts to provide an explanation for why people tend to ignore opportunity costs when making resource allocation decisions. In this study, however, knowledge structures research is applied to improve our understanding of the role of accounting knowledge in resource allocation tasks that require incorporation of opportunity costs. Second, prior studies use graduate business students and/or CPAs as subjects, but do not measure the level of accounting knowledge of the graduate business students. Therefore, no reliable conclusions can be drawn about the effects of accounting knowledge on decision makers' tendencies to ignore opportunity costs. In contrast, the subjects used in the current study are selected from groups likely to have distinctly different levels of accounting knowledge. Third, to rule out poor general performance by high-accounting knowledge decision makers as an explanation of the observed results, the study controls for analytical ability and manipulates decision context.

Finally, this study is one of few (Chase and Simon 1973; Marchant et al. 1991) to address the dysfunctional effect of knowledge of a subject matter by examining specific conditions under which high-accounting knowledge may hinder performance. Most of the behavioral accounting studies that examine the effects of knowledge and/or experience on performance (Libby 1985; Plumlee 1985; Frederick and Libby 1986; Libby and Frederick 1990; Frederick 1991; Bonner et al. 1992; Spilker 1995) address the *benefits*, but not the *costs*, of high knowledge and/or experience. The findings of this study suggest that the benefits usually associated with high knowledge and/or experience (e.g., increased processing speed, more complete problem representation, more accurate decisions, etc.) may sometimes be overshadowed by a lack of fit between the knowledge structures recalled from memory and the problem-solving situation at hand (Frensch and Sternberg 1989; Libby and Luft 1993; Nelson et al. 1995).

The remainder of this paper contains four sections. Section II develops the motivation and hypotheses. Sections III and IV, respectively, present the research design and results. Section V discusses the results and possible implications for accounting theory, education and practice.

II. MOTIVATION AND HYPOTHESES

Prior Accounting Research on the Use of Opportunity Costs in Decision Making

The essence of the economic principle of opportunity costs is that the cost of a resource used in a particular application is determined by the value of the resource if used in the best foregone alternative (Solomons 1966; Thompson 1973; Mansfield 1977; Coase 1981; Heymann and Bloom 1990; Zimmerman 1995, 24). That is, opportunity costs are the estimated foregone receipts from actions that could, but will not, be undertaken (Zimmerman 1995, 26). When all uses of a resource cannot be accommodated, choices must be made between or among alternative uses; thus, every act of choice also involves an act of sacrifice. When resources are limited relative to demands, one must consider opportunity costs to make the optimal decision.

The set of information potentially available in a resource allocation decision includes both historical accounting costs and opportunity costs. While opportunity cost is a forward-looking, or *ex ante* concept, historical accounting costs measure the resources expended for actions actually undertaken. Generally Accepted Accounting Principles (GAAP)-based rules are concerned primarily with producing *ex post* reports of states or outcomes of business decisions, and with matching historical expenses to revenues (Kaplan 1984, 99; Zimmerman 1995, 26). Alternative actions that might have been considered contemporaneously in decision making are neither measured nor recorded in the organization's accounting system (Horngren and Foster 1991, 377). Thus, while optimal decision making incorporates opportunity costs, externally reported historical financial accounting measures do not generally include them.

Existing empirical research suggests that decision makers tend to ignore or underweight opportunity costs in resource allocation decisions when the costs are not explicitly provided (Becker et al. 1974; Neumann and Friedman 1978; Friedman and Neumann 1980; Hoskin 1983). Becker et al. (1974) present graduate business students with a choice between two mutually exclusive projects whose margins are equal if opportunity costs are considered. The authors find that the subjects are not indifferent between the two projects because they ignore opportunity costs. Neumann and Friedman (1978) replicate and extend the Becker et al. (1974) study by asking graduate business students to evaluate mutually exclusive investment projects with different margins. The authors find that the subjects consider opportunity costs only when they are explicitly provided. In an extension to their first study, Friedman and Neumann (1980) find that graduate business students and CPAs tend to ignore equally opportunity costs when only partial or no information is provided about the costs.² Hoskin (1983) shows that even when graduate business students are exposed to explicit opportunity cost information, they are not more likely to consider opportunity cost information that is provided implicitly in subsequent problems.

Although prior studies provide evidence that individuals tend to ignore opportunity costs, they do not specify factors that influence the tendency to ignore these costs. The current study extends prior research by examining whether differential knowledge of GAAP-based rules and decision context are related to the failure to consider opportunity costs. As discussed in the next section, knowledge structures research—coupled with the expectation of constant knowledge of the opportunity-cost concept across accounting knowledge levels—will help provide a basis for understanding the role of accounting knowledge in resource allocation decisions that incorporate opportunity costs.³

Cognitive Processes, Accounting Knowledge and Opportunity Cost Consideration

According to Holland et al. (1986), the process of cognition (or reasoning) occurs when information from external sources is combined with knowledge structures recalled from long-term memory. For example, Anderson et al. (1991) use Holland et al.'s (1986) theoretical framework to provide a detailed model of the cognitive processes by which auditors form professional judgments.⁴ The Anderson et al. (1991) model illustrates that cognition

² The CPAs used in the Friedman and Neumann (1980) study presumably had accounting-related experience. However, the study provides no demographic information about the graduate business students.

³ The expectation of constant knowledge of the opportunity-cost concept across accounting knowledge levels is tested empirically. The description of the validity test and results are reported in section IV of the paper.

⁴ In a related study, Bonner and Pennington (1991) provide a review and synthesis of the audit judgment literature using explanations based on the knowledge and types of cognitive processes needed for performing specific tasks. The cognitive-psychology literature cited by Bonner and Pennington (1991) is encompassed by Holland et al.'s (1986) theoretical framework.

is guided by a system of rules developed through formal instruction and/or as a result of accumulated experiences with a given concept or procedure. This rule-based system can be thought of as a network which evaluates competing knowledge structures, discarding some, storing others, and modifying those that already exist. They also show that cognition is highly knowledge- and context-dependent. A specific context will trigger recall of knowledge structures that are presumed relevant in that context (Chase and Simon 1973; Frensch and Sternberg 1989; Marchant et al. 1991).

Prior accounting research provides evidence that different rule-based systems developed through formal instruction and/or experience lead to different representations of knowledge in long-term memory. For example, Frederick (1991) shows that the way in which the auditor's knowledge of internal controls is organized in memory (i.e., taxonomic vs. schematic representation) differentially affects their recall. Similarly, Choo and Trotman (1991) show that experienced and inexperienced auditors recall information from memory differently and, thus, their going-concern judgments differ.

Both knowledge structures research and prior empirical studies suggest that individuals who have received formal accounting training are expected to have accounting knowledge structures stored in long-term memory (Holland et al. 1986). I maintain that accounting knowledge structures are dominated by GAAP. As previously discussed, GAAP does not generally incorporate opportunity costs. Application of knowledge structures research to a resource allocation decision process suggests that: (1) the decision context triggers recall of accounting and normative knowledge structures from long-term memory; (2) the quality and completeness of the cognitive problem representation (an internal, unobservable state) is dependent on these knowledge structures; and (3) the cognitive problem representation developed by the individual, along with his or her analytical ability, determines the individual's tendency to ignore opportunity costs (an observable state) in resource allocation decisions.⁵

Prior research indicates that decision quality is eroded when there is a lack of fit between the knowledge structures recalled from memory and the given problem-solving situation (Chase and Simon 1973; Marchant et al. 1991). For example, Chase and Simon (1973) give chess masters and novice chess players five-second exposures to a chessboard set randomly with chess pieces. The subjects' task is to reconstruct the positions of the chess pieces from memory. Chase and Simon (1973) find that chess masters perform worse than beginners because the chess masters attempt to place the pieces according to the strategies and rules in their knowledge structures. Because such rules are violated when pieces are arranged randomly, the recalled knowledge structures inhibit the chess masters' performance in the context of this particular task.

In a tax context, Marchant et al. (1991) examine analogical transfer and its relation to expertise in legal reasoning. The authors conduct a series of experiments using introductory tax students and experienced tax practitioners as subjects. They find that in solving novel tax problems, the novice tax students outperform the experienced tax practitioners. The results of their study suggest that novel tax problems cause experienced subjects to recall inappropriate knowledge structures, and their reliance on these inappropriate structures inhibits their ability to solve the novel problem. The Chase and Simon (1973) and Marchant et al. (1991) studies provide evidence of the dysfunctional effects resulting from the lack

⁵ The accounting literature has recognized that individual differences in abilities affect the acquisition of knowledge (e.g., see Mock and Vasarhelyi 1984). Thus, consistent with prior research, this study controls for the potential effects of analytical ability on performance (Frederick and Libby 1986; Butt 1988; Bonner 1990; Frederick 1991; Nelson 1993).

of fit between the knowledge structures recalled from memory and the given problem-solving situation.

The studies cited above suggest a possible link between accounting knowledge and the consideration of opportunity costs in decision making. In particular, when decision makers with high-accounting knowledge are presented with an information set to assist in making a business resource allocation decision, they construct a problem representation based on their knowledge of GAAP-based rules. Thus, those with high-accounting knowledge may fail to consider opportunity costs because their GAAP-based representation of the problem does not indicate to them the need to consider these costs. To test these suggestions, the following alternative-form hypothesis is proposed:

- H1:** The number of opportunity costs ignored in a business resource allocation decision will be greater for decision makers with *high* accounting knowledge than for decision makers with *low* accounting knowledge.

Decision Context

Prior research provides evidence that context triggers recall of domain-specific knowledge from long-term memory, which in turn affects performance (Butt 1988; Marchant 1989; Nelson 1993). Butt (1988) examines the effects of audit expertise in financial statement error frequency judgments. She finds that experienced auditors perform better than inexperienced auditing students when the judgment task is posed in an audit context, but not when the task is posed in a generic context. Marchant (1989) uses the same type of subjects to examine the role of analogical reasoning and experience in hypothesis generation. He finds that experienced auditors outperform inexperienced auditing students, but only in auditing tasks that trigger recall of domain-specific knowledge.

Nelson (1993) uses accounting and non-accounting students and experienced auditors to examine the effects of error frequency and accounting knowledge on error diagnosis in analytical review. He predicts that performance improves with knowledge of accounting principles. To avoid confounding the effects of knowledge differences with differences in ability across groups, the subjects are randomly assigned to one of two different contexts, namely, analytical procedures or medical diagnosis. Nelson finds no significant differences in performance between levels of accounting knowledge in the medical diagnosis context, but significant differences between each level of accounting knowledge in the analytical procedures context. This evidence suggests that accounting knowledge plays a role only in contexts which trigger its application.⁶

The studies cited above suggest that there is a link between decision context and the recall of knowledge structures. An implication of these studies is that when high-accounting knowledge decision makers are presented with an information set to assist in making a resource allocation decision, they will be more likely to access their GAAP-based knowledge from memory in business decisions than in personal decisions. Thus, they will have a higher tendency to ignore opportunity costs in a business decision context than in a personal decision context because the latter context will not usually trigger the application of accounting knowledge. The following alternative-form hypothesis tests these suggestions:

- H2:** The number of opportunity costs ignored by high-accounting knowledge decision makers will be greater in a resource allocation decision posed in a *business* context than in a resource allocation decision posed in a *personal* context.

⁶ Further research on the effects of context and domain-specific knowledge on performance also comes from medical studies on clinical diagnosis accuracy (Patel et al. 1989).

Analytical Ability

This study makes no *a priori* predictions about differences in analytical ability between individuals with high-accounting knowledge and those with low-accounting knowledge.⁷ However, prior research suggests that analytical ability may affect subjects' decision behavior. For example, prior behavioral accounting studies have controlled for the potential effects of analytical ability on performance (Frederick and Libby 1986; Butt 1988; Bonner 1990; Frederick 1991; Nelson 1993), and several auditing studies suggest a positive association between analytical ability and performance in audit tasks (Bonner and Lewis 1990; Libby 1992; Libby and Tan 1992). Therefore, although analytical ability is assumed in this study to be constant across groups, and above the minimum necessary for the experimental task, its potential effect on performance is controlled for in the study by measuring and statistically removing it.

III. RESEARCH DESIGN

A between-subjects experiment involving a resource allocation task was constructed to focus on two factors: accounting knowledge and decision context. The level of accounting knowledge possessed by the participants is operationalized as a dichotomous categorical measure (high or low), based on graduate degree program membership, and as a continuous measure, based on the number of accounting courses completed. The second factor is the decision context, namely, business or personal.

A total of 80 students from graduate business administration and accounting programs at the University of Texas at Austin participated in the experiment. The participants received monetary compensation consisting of a flat payment of \$10.00, plus a performance-contingent bonus. The bonus had two purposes: (1) to encourage subjects to commit more cognitive effort to the analysis; and (2) to encourage subjects to provide complete and clear supporting computations.⁸

Case Materials and Procedures

The study was conducted in two parts: the experiment phase and the post-experiment phase (hereafter denoted Parts One and Two, respectively). In Part One, the case materials included the instructions, the assignment memorandum, supporting addenda, and a response memorandum. In Part Two, the materials included a reaction questionnaire, a combined test of analytical ability and opportunity costs knowledge, and a background questionnaire.⁹ Figure 1 summarizes the experimental procedures of Parts One and Two.

⁷ Analytical ability is composed of two constructs: analytical reasoning and logical reasoning. Analytical reasoning is the ability to analyze a given structure of arbitrary relationships and to deduce new information from that structure. Logical reasoning is the ability to analyze and critique argumentation by understanding and assessing relationships among arguments or parts of an argument (Graduate Record Examinations Board 1990).

⁸ Three graduate accounting students who did not meet one of the two criteria for classification in the high-accounting knowledge group (discussed in the "Independent and Dependent Variables" section), and four students who failed to provide supporting computations were excluded from the analyses. Thus, the analyses are based on a sample of 73 subjects. The subjects received the flat payment immediately upon completing the experiment and submitting the materials. The performance-contingent bonus, paid to the subjects one week after the experiment was conducted, was based on a composite score computed from the number of opportunity costs considered by the subjects in their resource allocation recommendations, plus the subjects' scores on an analytical ability test. Participants whose scores were in the top quartile received a bonus of \$15.00, the next quartile received \$10.00, and the third quartile received \$5.00; the bottom quartile did not receive a bonus.

⁹ The experiment was conducted in the University of Texas' Graduate School of Business Behavioral Laboratory in 14 two-hour sessions over three consecutive days. Subjects were free to choose the day and time of their voluntary participation. The experimenter was present in all of the sessions. The number of subjects in any particular session ranged from three to 12. Both contexts, business and personal, were distributed in each session. Measures were taken such that subjects sitting contiguously worked on different contexts. Subjects completed the required tasks of Parts One and Two in 45 minutes each, on average.

FIGURE 1
Sequence of Experimental Procedures

Part One: Experiment Phase

<i>Procedure</i>	<i>Description</i>
1. Read general instructions	Information about the study, tasks and monetary compensation scheme
2. Read assignment memorandum	Brief description of the client, the problem situation, and the resource allocation recommendation requested by the client
3. Read supporting addenda	Client's letter and staff memorandum containing detailed financial and non-financial information about the client
4. Complete response memorandum	Elicited recommendation, supporting calculations, and a brief explanation of the rationale underlying the recommendation

Part Two: Post-Experiment Phase

<i>Procedure</i>	<i>Description</i>
1. Complete reaction questionnaire	Debriefing questions
2. Complete reasoning exercise	Analytical ability and opportunity cost knowledge tests
3. Complete background questionnaire	Academic background and work experience questions
4. Receive monetary compensation	Flat compensation paid upon completion of Parts One and Two

In Part One, subjects assumed the role of a financial consultant asked by a partner to recommend a resource allocation for a new client. Each participant was presented with one of two structurally equivalent cases in a *business* or a *personal* context. In the *business* case, a shopping mall has been scheduled for condemnation by the state government. The president of one of the mall's retail branch stores asks whether she should vacate the retail space at the end of the current year or at the end of the forthcoming year. In the *personal* case, a civilian is employed in the data processing department at an Air Force Base scheduled for closure at the end of the forthcoming year. The civilian asks whether he should leave his job at the Base at the end of the current year or at the end of the forthcoming year. To reduce both task complexity and the potential for different interpretations of the task, subjects were instructed to ignore income taxes. Appendices A and B show the instructions for Part One and the staff memorandum provided to the participants in the business and personal context conditions, respectively.¹⁰

¹⁰ The case materials were calibrated in a two-stage pilot test with the assistance of six persons at the University of Texas at Austin. In the first stage, two management accounting professors and a graduate business student who was also a 20-year veteran Air Force Lieutenant Colonel were asked to read the case narratives and to "think aloud" as they evaluated the information. The case materials were revised in the first stage to enhance the completeness and accuracy of the information set provided. In the second stage, the revised case materials were pilot-tested with three graduate business students, and were further revised to enhance their clarity.

Independent and Dependent Variables

Decision context was manipulated by using two resource allocation cases, one in a business context and one in a personal context. Two knowledge groups were sampled and formed the dichotomous categorical measure of accounting knowledge: the low-accounting knowledge group and the high-accounting knowledge group. The low-accounting knowledge group consists of 33 subjects who: (1) were enrolled in the Master in Business Administration program, and (2) had completed no more than four accounting courses. These subjects reported completing an average of two accounting courses, with a range of one to four.¹¹ The high-accounting knowledge group consisted of 40 subjects who: (1) were enrolled in the Master in Professional Accounting program, and (2) had completed at least seven accounting courses (indicative of students who are in their last two years of their professional accounting degree programs).¹² These subjects reported completing an average of 12.23 accounting courses, with a range of seven to 22.¹³ Accounting knowledge is also measured continuously, based on the number of accounting courses completed by subjects.

The dependent variable is measured as the number of opportunity costs omitted by the subjects in their recommendations. There are a total of five possible opportunity costs in each decision context (discussed below). The opportunity costs were selected for inclusion in the case narratives after a review of both prior accounting research on opportunity costs and behavior (Becker et al. 1974; Neumann and Friedman 1978; Friedman and Neumann 1980; Hoskin 1983), and current authoritative textbooks and monographs on opportunity costs and resource allocation decisions (Atkinson 1987; Heymann and Bloom 1990; Horngren and Foster 1991, 377).

As discussed earlier, opportunity costs are defined as the benefit foregone from a given decision, or the receipts that could have been obtained if that particular decision had not been made (Zimmerman 1995, 92). In both decision contexts, the subjects were required to choose between recommending the client to take a given action at the end of the current year, or at the end of the forthcoming year. These mutually exclusive options involve a trade-off in receipts and expenditures over time, thus giving rise to opportunity costs. Specifically, in the business context, the following five opportunity costs would have to be considered if the president decided to wait one year before relocating the store: (1) the return on the disposal proceeds of the store's fixed assets; (2) the sublease revenue on the store's current retail location; (3) the return on the differential compensation award offered by the lessor; (4) the return on the differential advertising; and (5) the opportunity cost of capital used to compute the discounted value of cash flows.

Similarly, in the personal context, the following five opportunity costs would have to be considered if the civilian currently employed at an Air Force Base decided to wait one year before leaving his job: (1) the return on the disposal proceeds of the civilian's fixed assets; (2) the sublease revenue on the civilian's current condominium; (3) the return on

¹¹ Seventy-three percent of the low-accounting knowledge subjects reported having undergraduate and/or graduate degrees in nonbusiness-related disciplines (e.g., liberal arts, law, psychology, engineering, physics, political economics). The remaining 27 percent reported having undergraduate and/or graduate non-accounting business degrees (e.g., management, marketing, computer sciences, operations research). Also, the low-accounting knowledge subjects reported having no accounting-related experience.

¹² Three students enrolled in the Master in Professional Accounting program had completed between five and six accounting courses, and thus, were excluded from the analyses because they did not meet the second criterion for classification in the high-accounting knowledge group.

¹³ Seventy percent of the high-accounting knowledge subjects reported having accounting-related experience, ranging from one month to 50 months, for an average of 8.53 months. Also, two high-accounting knowledge subjects were CPAs.

the differential compensation award offered by the government; (4) the return on the differential salary; and (5) the opportunity cost of capital used to compute the discounted value of cash flows. The financial magnitude of the opportunity costs included in the business context case differed by a multiple of ten from the opportunity costs included in the personal context case.

The key feature of the design was the presentation of the opportunity cost items in the staff memorandum. Specifically, each of the opportunity cost items was implicitly presented (i.e., without an explicit historical financial statement), and in juxtaposition to a parallel historical (accounting) cost or revenue. This manipulation allowed me to distinguish which information cue—opportunity cost or historical cost—the subjects used in their analyses. For example, a paragraph in the staff memorandum contained information that could assist subjects in computing the cost of borrowing rate (i.e., an accounting-related cue), while information contained in another paragraph could assist subjects in computing the opportunity cost of capital. However, the staff memorandum was silent as to which (or whether any) of the two rates was required for the analysis. This intentional omission allowed me to test whether the subjects used the cost of borrowing rate, or the normatively correct opportunity cost of capital.

Subjects in both contexts also were presented with information regarding the net book value of fixed assets, as well as parallel information regarding the expected disposal value of those assets within a two-year period. The key distinction, for purposes of measuring the dependent variable, was whether subjects used in their analyses the accounting profit on the fixed assets' disposal, or the foregone return on the fixed assets' disposal proceeds. Subjects also were presented with information regarding the lease cost of a retail space or condominium, as well as parallel information about the going rate of lease renewals. In this case, the key distinction was whether subjects used in their analyses the accounting cost of the lease, or the foregone sublease revenue on the retail space or condominium.¹⁴

IV. RESULTS

Results of Validity Tests

Knowledge of the opportunity cost concept, analytical ability and perceptions of task difficulty were not expected to differ between high- and low-accounting knowledge subjects in the business context, or between high-accounting knowledge subjects in the business context and their counterparts in the personal context. To validate the assumption of constant knowledge of the opportunity cost concept, subjects were given eight questions to measure their knowledge of this concept.¹⁵ In the business context, the mean scores for high- (6.28; s.d. = 1.02) and low- (6.38; s.d. = 1.50) accounting knowledge subjects do not differ

¹⁴ Two coders (an experienced accounting instructor and an accounting doctoral student) independently coded the dependent variable. The coders were compensated and received training with facsimile practice cases. A negligible number of differences had to be reconciled between the coders.

¹⁵ The test was validated with 26 "economically naive" undergraduate business students who were enrolled in an introductory financial accounting course at the University of Texas at Austin. The number of economics courses that these subjects reported completing ranged from zero to two. The Kuder Richardson 20 reliability coefficient (Crocker and Algina 1986, 131–156) was calculated. This coefficient measures the degree of relationship between the examinee's true and observed scores on a test. The reliability coefficient achieved with the undergraduate students was 0.62. The average test score of the undergraduate students (3.0) was lower than the average score of the experimental subjects (6.32). The overall distributions of scores of the undergraduate students and the experimental subjects are significantly different (Mann-Whitney $U = 164$; $p = .000$, two-tailed). These results suggest that the opportunity cost knowledge test reasonably measures knowledge (or lack thereof) of opportunity costs. That is, the average scores are low when they are expected to be low, and high when they are expected to be high.

significantly ($F = 0.049$; $p = .825$). Also, in the high-accounting knowledge level, the mean score for subjects in the business context (6.28; s.d. = 1.02), and for subjects in the personal context (6.73; s.d. = 1.28) do not differ significantly ($F = 1.462$; $p = .234$).¹⁶

To validate the assumption of constant analytical ability, subjects were given eight questions indicative of analytical ability selected from prior Graduate Record Examinations. In the business context, the mean scores for high- (6.89; s.d. = 1.18) and low- (7.06; s.d. = 1.12) accounting knowledge subjects do not differ significantly ($F = 0.191$; $p = .665$). Also, in the high-accounting knowledge level, the mean score for subjects in the business context (6.89; s.d. 1.18), and for subjects in the personal context (7.23; s.d. = .685) do not differ significantly ($F = 1.281$; $p = .265$).¹⁷

To validate the assumption of similar perceptions of task difficulty, subjects were asked to evaluate the task on a ten-point scale anchored on one end by "Not difficult" (1) and on the other end by "Very difficult" (10). In the business context, the mean scores for high- (4.32; s.d. = 2.21) and low- (4.61; s.d. = 2.52) accounting knowledge subjects do not differ significantly ($F = 0.128$; $p = .723$). Also, in the high-accounting knowledge level, the mean scores for subjects in the business context (4.32; s.d. = 2.21), and for subjects in the personal context (4.43; s.d. = 1.94) do not differ significantly ($F = 0.028$; $p = .868$). In conclusion, taken together, the results of the validity tests suggest that cell-level differences in the subjects' knowledge of the opportunity cost concept, analytical ability and perceptions of task difficulty did not drive their tendencies to ignore opportunity costs in resource allocation tasks.¹⁸

Descriptive Statistics

Panel A of table 1 presents descriptive statistics for the average number of opportunity cost items omitted by the subjects. Panel A shows that the overall mean number of opportunity cost items omitted by the subjects was 2.04. Averaged across contexts, the mean number of omissions was higher for subjects with *high* accounting knowledge than for subjects with *low* accounting knowledge (2.42 vs. 1.67, respectively). Also, averaged across accounting knowledge categories, the mean number of omissions was higher in the business context than in the personal context (2.43 vs. 1.66, respectively). These differences in the row and column means are due largely to the high-accounting knowledge/business context subjects who averaged 3.11 omissions (cell 1), while means of the other three groups (cells 2 through 4) ranged from 1.59 to 1.75.

Panel B of table 1 presents the total number and percentage of subjects who omitted each opportunity cost item, by accounting knowledge/context combination.¹⁹ Panel B shows that for all the opportunity cost items, the highest percentages of omissions are in the

¹⁶ The cell-level comparisons addressed by the validity tests are consistent with the comparisons addressed by H1 (i.e., in the *business* context, high- vs. low-accounting knowledge subjects) and H2 (i.e., in the *high*-accounting knowledge level, business vs. personal context conditions). Additional validity tests were conducted to compare the mean scores between high- and low-accounting knowledge subjects (i.e., across contexts), and the mean scores between the business and the personal context conditions (i.e., across accounting knowledge levels). The results of parametric and non-parametric tests are qualitatively similar to the results of validity tests conducted at the cell level; that is, the mean scores are not significantly different.

¹⁷ The mean analytical ability scores for the high- and low-accounting knowledge subjects (i.e., across contexts) were 7.06 and 7.03, respectively. These high scores may indicate the presence of ceiling effects in the test of analytical ability.

¹⁸ Non-parametric tests were also conducted. The results are qualitatively similar to the results of the F-tests.

¹⁹ For each cross-classification condition, the sum across the five opportunity cost items of the frequencies of omissions divided by the total number of subjects in each cross-classification equals the cell means reported in panel A.

TABLE 1
Descriptive Statistics and Planned-Comparisons Tests for the Average Number of Opportunity Costs Omitted, by Accounting Knowledge/Context Combination
 (n = 73)

Panel A: Descriptive Statistics (standard deviations in parenthesis; the maximum possible number of opportunity cost omissions was five, and the minimum was zero)^a

<i>Accounting Knowledge</i>	<i>Decision Context</i>		<i>Overall</i>
	<i>Business</i>	<i>Personal</i>	
	1	2	
<i>High</i>	3.11 (1.45) n = 18	1.73 (1.39) n = 22	2.42 (1.42) n = 40
	3	4	
<i>Low</i>	1.75 (1.39) n = 16	1.59 (1.54) n = 17	1.67 (1.47) n = 33
<i>Overall</i>	2.43 (1.42) n = 34	1.66 (1.47) n = 39	2.04 (1.44) n = 73

^a Results of the statistical analyses that control for analytical ability are qualitatively similar to those that do not control for analytical ability. Thus, for presentation purposes, the means reported here are the raw (observed) means (i.e., not adjusted for analytical ability).

Panel B: Total Number (Percentage) of Opportunity Costs Omitted, by Accounting Knowledge/Context Combination^{b,c}

<i>Opportunity Cost</i>	<i>Accounting Knowledge</i>	<i>Decision Business</i>	<i>Context Personal</i>
Foregone return on fixed assets' disposal proceeds	High	13 (72.2)	8 (36.4)
	Low	5 (31.3)	8 (47.1)
Foregone sublease revenue	High	13 (72.2)	6 (27.3)
	Low	10 (62.5)	1 (5.9)
Foregone return on advertising (business)/salary (personal)	High	12 (66.67)	8 (36.36)
	Low	5 (31.25)	4 (23.53)
Opportunity cost of capital	High	9 (50.0)	6 (27.3)
	Low	6 (37.5)	7 (41.2)
Differential compensation award	High	9 (50.0)	10 (45.5)
	Low	2 (12.5)	7 (41.2)

^b Entries are number and (percentage) of subjects omitting the opportunity costs in the cross-classification condition. The percentages are the ratio of the number of subjects omitting the opportunity cost to the total number of subjects in each cross-classification condition.

^c Number of subjects in each cross-classification condition: High-Business (n = 18); High-Personal (n = 22); Low-Business (n = 16); Low-Personal (n = 17).

Panel C: Planned Comparisons (dependent variable is the number of opportunity costs omitted)

<i>Planned Comparisons</i>	<i>Mean Square</i>	<i>t-statistic</i>	<i>Probability (one-tailed)</i>
Business context: (cell 1 vs. cell 3, panel A) high- vs. low-accounting knowledge (H1)	13.31	2.70	.000
High-accounting knowledge: (cell 1 vs. cell 2, panel A) business vs. personal context (H2)	13.30	2.70	.000

high-accounting knowledge/business context combination (ranging from 50 percent to 72.2 percent).²⁰ Panel B also shows that the opportunity cost items that appear to have contributed the most to the mean differences reported in panel A were the foregone return on the fixed assets' disposal proceeds, the foregone sublease revenue, and the return on the differential advertising/salary costs; all costs were omitted by at least 67 percent of the subjects in the high-accounting knowledge/business context combination. The opportunity cost of capital and the discounted value of the differential compensation award made a moderate contribution to the mean differences reported in panel A; both costs were omitted by 50 percent of the subjects in the high-accounting knowledge/business context combination.²¹

Tests of Accounting Knowledge (H1) and Decision Context (H2)

Panel C of table 1 reports the results of the planned comparisons for purposes of testing H1 and H2, after controlling for analytical ability.²² H1 predicts that in the business context, high-accounting knowledge decision makers are more likely to ignore opportunity costs in a resource allocation decision than are low-accounting knowledge decision makers (cell 1 vs. cell 3, panel A). The planned comparison for testing H1 shows that, as predicted, the effect of accounting knowledge in the business context, after controlling for analytical ability, is positive and significant ($t = 2.70$; $p = .000$, one-tailed). This result indicates that, on average, the number of opportunity costs omitted in the business context is higher for subjects with high-accounting knowledge than for subjects with low-accounting knowledge.²³

Hypothesis two predicts that high-accounting knowledge individuals will ignore more opportunity costs in the business context than in the personal context (cell 1 vs. cell 2, table 1). The planned comparison for testing H2 is presented in table 1, panel C. As predicted, the effect of context in the high-accounting knowledge level, after controlling for analytical ability, is positive and significant ($t = 2.70$; $p = .000$, one-tailed), thus

²⁰ Each of the five opportunity cost items was analyzed separately using tests of homogeneity of distributions (Hildebrand and Ott 1991, 460–462). These tests are appropriate here since the subjects were sampled from two different accounting knowledge groups (as denoted by the rows in panel B of table 1). Thus, the null hypothesis tested is that the row distributions (or proportions) are homogeneous. Results of the tests of homogeneity allow rejection of the null hypothesis for four of the five opportunity cost items (p-values range from .000 to .032, one-tailed), thus suggesting that the distribution (or proportion) of subjects' omissions was significantly higher in the high-accounting knowledge/business context combination than in the other three knowledge/context combinations. The foregone revenue on advertising (business)/salary (personal) was not significant (Chi-square = 0.892, $p = .345$, one-tailed).

²¹ The normatively correct rate to discount the cash flows to their present value is the opportunity cost of capital of 18 percent. As shown on panel B of table 1, 28 subjects made errors in cost of capital calculations. Of these, 21 subjects (75 percent) used the 12 percent cost of borrowing rate, and seven subjects (25 percent) ignored the cost of capital altogether.

²² Analytical ability, the covariate in the overall ANCOVA model, is negative and significant, as expected ($t = -3.175$, $p = .002$), thus suggesting that the number of opportunity costs omitted increases as analytical ability decreases. The homogeneity of slope assumption for the analytical ability covariate was tested using the general linear model procedure (Ott 1988, 818–821). The results do not allow rejection of the null hypothesis that the slopes for the covariate are homogeneous ($F = 0.327$, $p > .50$). Also, the results of the Levene test (SPSS 1993, 187–188) conducted to test for the assumption of homogeneity of variance, were not significant (Levene statistic = 0.048, $p = .827$).

²³ Consistent with the theoretical development, there is no *a priori* reason to expect a significant *simple* main effect of accounting knowledge in the personal context. The results of the planned comparison in the personal context confirm this assumption ($t = 0.48$; $p > .63$, two-tailed).

indicating that, on average, the number of opportunity costs omitted by high-accounting knowledge subjects is higher in the business context than in the personal context.²⁴

Regression analysis was also conducted to test for the effects of accounting knowledge on tendencies to ignore opportunity costs, when accounting knowledge is measured as a continuous variable, based on the number of accounting courses that subjects reported completing. Hypothesis one was tested by estimating the following regression equation:

$$Y_i = \beta_0 + \beta_1 AK_i + \beta_2 (AK_i * BC_i) + \beta_3 AA_i + \varepsilon_i \quad (1)$$

where Y_i is the number of opportunity cost items omitted by subject i ; AK_i is accounting knowledge, as measured by the number of accounting courses completed by subject i ; BC_i is 1 if subject i is in the business context, and 0 otherwise; and AA_i is the analytical ability covariate, measured by subject i 's score on the analytical ability test. Specifically, the regression equation allows for different slopes for the effects of accounting knowledge in the business and personal contexts, and controls for the potential effects of analytical ability on tendencies to ignore opportunity costs.

Table 2 shows that the regression equation is significant overall (F -statistic = 9.709; $p = .000$), and explains 29.68 percent of the variation in the number of opportunity costs omitted. As expected, the coefficient for the effects of accounting knowledge in the personal context (β_1) is not significant ($t = 1.104$; $p = .137$, one-tailed). The finding of most interest in this analysis is the significant and positive coefficient for β_2 that reflects the effects of accounting knowledge in the business context ($t = 3.172$; $p = .001$, one-tailed). This result supports H1, indicating that more opportunity costs are ignored in the business context by those subjects with greater accounting knowledge (as measured by the number of accounting courses completed). The coefficient for the effects of analytical ability (β_3) is negative and significant, as expected ($t = -3.059$; $p = .002$, one-tailed), indicating increases in opportunity cost omissions as analytical ability decreases.

Refining the Observed Associations: Investigation of Maximization Objective as an Intervening Factor

Intuition suggests that the method of analysis used by the subjects to support their recommendations should be consistent with their maximization objectives. That is, subjects whose objective was to maximize net income presumably would be more likely to use income statement analysis to support their recommendations, while subjects whose objective was to maximize the present value of cash flows (hereafter PVCFs) would be presumably more likely to use cash flow analysis to support their recommendations. The experimental design purposely did not control for the maximization objective *ex ante*, thus allowing the subjects to self-select the method of analysis. This is an important design feature, because as the theoretical development suggests, different maximization objectives are likely to

²⁴ Consistent with the theoretical development, there is no *a priori* reason to expect a significant *simple* main effect of context in the low-accounting knowledge level. The results of the planned comparison in the low-accounting knowledge level confirm this assumption ($t = 0.39$; $p > .710$, two-tailed). Finally, it is not clear whether subjects in the business context who ignored the sublease revenue might have incorrectly assumed that the retail store would be paying a higher market rental rate in its new location across town (thus offsetting the sublease revenue). This is less likely in the personal context case, which indicated that the civilian would be moving to another state (i.e., market rental rates vary by states). Thus, the sublease revenue might seem less relevant in the business context than in the personal context. To address this potential concern, additional planned comparisons were conducted to test for H1 and H2, excluding foregone sublease revenue from the list of opportunity costs. The results are qualitatively similar to the results reported in table 1 (H1: $t = 2.78$, $p = .000$, one-tailed; H2: $t = 1.83$, $p < .05$, one-tailed), thus suggesting that the results are robust to exclusion of the foregone sublease revenue from the list of opportunity costs.

TABLE 2
Regression Results for Effects of Accounting Knowledge in the Business Context (H1)
Accounting Knowledge Factor Measured as a Continuous Variable (n = 73)

$$Y_i = \beta_0 + \beta_1 AK_i + \beta_2 (AK_i * BC_i) + \beta_3 AA_i + \varepsilon_i$$

<i>Variable</i>	<i>Expected Sign</i>	<i>Coefficient</i>	<i>t-statistic</i>	<i>Probability (one-tailed)</i>
Intercept		4.819	4.171	.000
AK	(0)	0.034	1.104	.137
AK * BC	(+)	0.109	3.172	.001
AA	(-)	-0.480	-3.059	.002
F-statistic	9.709 (p = .000)			
R ²	0.2968 (adjusted = 0.2663)			
Std. Error	1.320			

Variable definitions:

- Y_i = the number of opportunity costs omitted by subject i ;
 AK_i = accounting knowledge, measured by the number of accounting courses completed by subject i ;
 BC_i = 1 if subject i is in the business context condition, and 0 otherwise;
 AA_i = analytical ability, measured by subject i 's score on an analytical ability test;
 ε_i = error term for subject i .

differentially influence the subjects' perceptions of salience of the external cues. Specifically, accounting-related information may be perceived as more salient than opportunity cost information when the objective is to maximize net income, while the reverse may be true when the objective is to maximize the PVCFs. Additional *ex post* analyses were conducted to investigate the role of the subjects' maximization objectives on their tendencies to ignore opportunity costs.

Analyses and Results

An analysis of the explanations and supporting calculations provided by the subjects in the response memorandum shows that they used one of two distinctly different and mutually exclusive methods of analysis and report formats to support their recommendations. Specifically, all subjects prepared either comparative income statements (where the bottom line is net income or net loss), or comparative cash flows statements (where the bottom line is the PVCFs). Furthermore, subjects who prepared income statements recommended the option which, based on their calculations, maximized net income. Accordingly, this group was assumed to have a net income maximization objective. Similarly, subjects who prepared cash flows statements recommended the option which, based on their calculations, maximized cash flows. Accordingly, this group was assumed to have a PVCFs maximization objective. The data show that eight of the 18 high-accounting knowledge subjects in the business context (44 percent) had a net income maximization objective, while ten (56 percent) had a cash-flow maximization objective. Also, eight of the 22 high-accounting knowledge subjects in the personal context (36 percent) had a net income maximization objective, while 14 (64 percent) had a cash-flow maximization objective.²⁵ The results of a Chi-square test of homogeneity do not allow rejection of the null hypothesis

²⁵ The data was coded independently by three senior accounting students at a private Midwestern university. The coders were compensated and received training with facsimile practice cases.

that the distributions (or proportions) of high-accounting knowledge subjects' maximization objectives in the business and personal contexts are homogeneous (Chi-square = 0.269; $p = .604$, one-tailed). These results suggest that high-accounting knowledge does not seem to cause subjects in the business context to behave differently from their counterparts in the personal context with respect to their maximization objectives.

If the knowledge structures-based findings reported in this study are generally descriptive of the tendency for high-accounting knowledge subjects to ignore opportunity costs in business decisions, then the findings should remain unchanged (i.e., significant), after controlling *ex post* for the subjects' maximization objectives. This expectation is investigated with an "augmented" version of regression equation (1) which adds a coefficient controlling for the maximization objective by statistically removing the effects of this factor on the dependent variable. Specifically, regression equation (2) takes the following form:

$$Y_i = \beta_0 + \beta_1 AK_i + \beta_2 (AK_i * BC_i) + \beta_3 AA_i + \beta_4 OBJ_i + \varepsilon_i \quad (2)$$

where Y_i , AK_i , BC_i and AA_i are as defined for regression equation (1), and OBJ_i is 1 if subject i 's objective was to maximize cash flows, and 0 if subject i 's objective was to maximize net income.

Table 3 shows the results of regression equation (2). As expected, the coefficients for the effects of accounting knowledge in the personal context (β_1) and for analytical ability (β_3) are consistent with the results for the same coefficients on regression equation (1). The findings most important to this analysis are threefold. First, consistent with the main findings of the study, the coefficient for the effects of accounting knowledge in the business context (β_2) remains positive and significant ($t = 3.395$; $p = .000$, one-tailed), even after controlling for the effects of maximization objective. Second, regression equation (2) explains 48 percent of the variation in the number of opportunity costs omitted, compared to the R-squared of 29.68 percent for regression equation (1). Third, and related to the second

TABLE 3
Regression Results for Effects of Accounting Knowledge in the Business Context
After Controlling for Analytical Ability and Maximization Objective (n = 73)

$$Y_i = \beta_0 + \beta_1 AK_i + \beta_2 (AK_i * BC_i) + \beta_3 AA_i + \beta_4 OBJ_i + \varepsilon_i$$

<u>Variable</u>	<u>Expected Sign</u>	<u>Coefficient</u>	<u>t-statistic</u>	<u>Probability (one-tailed)</u>
Intercept		4.973	4.966	.000
AK	(0)	0.020	0.761	.225
AK * BC	(+)	0.101	3.395	.000
AA	(-)	-0.343	-2.466	.008
OBJ	(-)	-1.458	-4.891	.000
F-statistic	15.683 ($p = .000$)			
R ²	0.4800 (adjusted = 0.4493)			
Std. Error	1.143			

Variable definitions:

$OBJ_i = 1$ if subject i had a cash flows maximization objective, and 0 if subject i had a net income maximization objective.

All other variables are defined in table 2.

finding, this improvement in the explanatory power of the regression equation is caused by the addition of the fourth coefficient, (β_4), to control for the effects of maximization objective. As shown in table 3, the coefficient is negative and significant ($t = -4.891$; $p = .000$, one-tailed), indicating that the net income (PVCFs) maximization objective is associated with a higher (lower) number of opportunity costs omitted.

In conclusion, the higher explanatory power of regression equation (2) suggests that subjects who developed a problem representation guided by a net income maximization objective were more likely to ignore opportunity costs than subjects who developed a problem representation guided by a PVCFs maximization objective. At the same time, the results of regression equation (2) lend support to the robustness of the main findings of this study, namely, high-accounting knowledge interferes with a decision maker's ability to incorporate opportunity costs in business resource allocation decisions, even after controlling for maximization objective.

V. DISCUSSION AND IMPLICATIONS

This study provides empirical evidence that high-accounting knowledge interferes with a decision maker's ability to incorporate opportunity costs into the analysis of a business resource allocation decision. However, such knowledge does not interfere with a decision maker's ability to incorporate opportunity costs into the analysis of a personal resource allocation decision. This study contributes to our understanding of how accounting knowledge affects behavior in several ways. First, consistent with knowledge-structures research, the study provides evidence that high-accounting knowledge subjects who make business resource allocation decisions behave as if they access from memory GAAP-based rules which do not incorporate opportunity costs. Second, this study contributes to our understanding of the effects of accounting knowledge by providing evidence that the tendency for high-accounting knowledge individuals to ignore opportunity costs is limited to decisions in a business context. This evidence tends to rule out the idea that high-accounting knowledge individuals, in general, ignore more opportunity costs across contexts than do low-accounting knowledge individuals.

Third, this study contributes to understanding the effects of accounting knowledge by providing evidence that the tendency of high-accounting knowledge individuals to ignore opportunity costs is observed even after controlling for the effects of the subjects' maximization objective. This evidence lends support to the robustness of the main findings of this study. Finally, most of the behavioral accounting studies that examine the effects of knowledge and/or experience address the *benefits*, but not the *costs*, of high knowledge and/or experience on performance. In contrast, this study addresses the dysfunctional effect of knowledge of a subject matter by examining specific conditions under which high-accounting knowledge may actually hinder performance. The findings of this study suggest that decision quality can be eroded due to the lack of fit between the accounting knowledge structures recalled from memory and the resource allocation problem, which requires consideration of opportunity costs.

The results of this study, on their face, may be discouraging to accounting educators. Modern managerial accounting courses include the topic of relevant costing, which emphasizes the importance of incremental and opportunity costs. However, the topic of relevant costing represents a small portion of the total accounting curriculum at most universities. The results of this study indicate that other aspects of the accounting curriculum, including an emphasis on GAAP-based rules, appear to overwhelm this particular aspect of the managerial accounting courses. The implications of the evidence presented in this paper for the

design of an accounting curriculum await further research addressing the limitations of the study and the robustness of its results.

Certain features of this study point to potential areas for future research. First, there is no clear explanation for why there is no causal association between the subjects' accounting knowledge and their maximization objectives. On one hand, this study argues that the phenomenon underlying the data is knowledge structures-driven, which therefore would suggest that subjects with high-accounting knowledge would be more likely than those with low-accounting knowledge to have a net income maximization objective in the business context. On the other hand, the nature of the subjects' formal accounting training, which presumably emphasizes the concept of present value of cash flows as well as the income statement, might have moderated any existing differences in the maximization objectives of high- and low-accounting knowledge subjects. More research is needed to better understand why, while high-accounting knowledge does not seem to cause subjects to use a net income maximization objective any more frequently than low-accounting knowledge, high-accounting knowledge does interfere with the subjects' ability to incorporate opportunity costs in their business decisions.

Second, this study obtains experimental control by eliciting resource allocation decisions absent other important characteristics of the managerial setting. While I believe this is a reasonable approach for the first knowledge structures-guided work in this area, future research could examine the generality of the results in more realistic settings. For example, future studies could examine the extent to which other factors (e.g., principal-agent opportunity cost information asymmetry), and other tasks (e.g., project continuation decisions) cause decision makers to leave opportunity costs out of their analyses. Future research may also address the extent to which different types of accounting training (e.g., predominantly financial vs. predominantly managerial vs. predominantly tax) and/or different types of domain-specific experience (e.g., financial accounting and valuation of long-term liabilities vs. inventory accounting) lead to differential exclusions of opportunity costs in business resource allocation decisions.

APPENDIX A
Resource Allocation Case in the Business Context

Andrew, Henderson & Company
Financial Planning Consultants

MEMORANDUM

DATE: December 26, 1993
TO: Engagement Associate
FROM: Steve James, Partner
SUBJECT: Closure of the retail location of the Harper & Baker's Sacramento store

I have just received the attached letter from Ms. Geraldine Evans, president and CEO of Harper & Baker, Inc. (H&B), a privately held corporation that owns a chain of women's clothing stores. Evans is seeking advice regarding a resource allocation problem related to the H&B's Sacramento store.

Evans has informed me, via telephone conversation, that the H&B's Sacramento store was opened in the 84-store Hancock Shopping Mall in suburban Sacramento, California about seven years ago. The Mall's retail locations are owned and managed by Retail Property Managers, Inc. (RPM). The Mall has been scheduled for condemnation by the State of California two years from now (12-31-95); thus, the H&B's Sacramento store cannot continue at its present location beyond the next two years.

I have enclosed additional client information compiled by our staff members to assist you in making your recommendation as to whether the retail space of the Sacramento store should be vacated on 12-31-93 (now), or on 12-31-94 (one year from now). I would like to have your recommendation and supporting calculations.

Attachments: Client's letter
Staff memorandum on operating characteristics

Andrew, Henderson & Company
Financial Planning Consultants
12-23-93

Attachment 2

STAFF MEMORANDUM

SUBJECT: Operations of the Harper & Baker's Sacramento
Store for the Year Ended December of 1993

Current Business Operations

Net retail sales were \$1,920,000 in 1993. The cost of goods sold represents approximately 30% of net sales. Operating expenses in 1993 amounted to \$1,020,000 (which includes advertising of \$120,000, depreciation of \$36,000, and general and administrative expenses of \$864,000).

The Sacramento store's fixed assets, which include display fixtures and equipment, were acquired 7 years ago at \$360,000. The average useful life of the fixed assets is 10 years, and are depreciated using straight line with zero salvage.

In 1993 all the H&B retail stores initiated a company policy of investing their excess cash in a common fund managed by the parent company. Each retail store, in turn, received a return equivalent to a pro-rata share of its investment in the common fund. The Sacramento store earned \$5,400 this year on an annual investment of \$30,000. This return is expected to remain constant over the next two years.

Lease Contract and Compensation Award

Four years ago Harper & Baker signed a 10-year transferable, noncancelable operating lease for the 4,000 square-foot retail location of the Sacramento store, at \$96,000 per year. Due to a recent earthquake, there is shortage of retail space in the area; thus, lease renewals are currently running at about \$144,000 per year for a 4,000 square-foot location.

Since RPM will be unable to fulfill its lease contract with H&B, it has offered to pay H&B a compensation award of \$300,000 if Evans chooses to vacate the retail space now. If, on the other hand, Evans chooses to vacate the retail space one year from now, the compensation award that H&B will receive one year from now will be \$320,000.

If Evans chooses to vacate the retail space now, she would sublease it to a third party for the next two years at the market rate. If, on the other hand, Evans chooses to vacate the retail space one year from now, she would sublease it to a third party for just 1995.

Financing

To help with financing and to establish a business presence in the community, H&B obtained from Sacramento Central Bank a loan of \$200,000. The loan is guaranteed with the H&B parent company assets. The annual interest (\$24,000), is due annually and is charged to the Sacramento store. The principal is due three years from now.

Prospects for the Next Two Years (1994 and 1995)**Projected annual operations:**

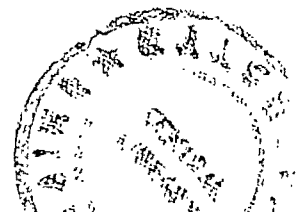
According to Evans, average net retail sales, as well as the ratio of cost of goods sold to net retail sales are expected to remain unchanged in real terms for the next two years. On the other hand, due to a new advertising campaign scheduled for the year of the relocation, average operating expenses are expected to increase during the relocation year. The following table summarizes projected annual net retail sales and operating expenses for the Sacramento store for 1994 and 1995 for the two options under consideration:

Projected Annual Net Retail Sales and Operating Expenses for 1994 and 1995

	<u>1994</u>	<u>1995</u>
Vacates retail space 12-31-93 (now):		
Net retail sales	\$1,920,000	\$1,920,000
Operating expenses	\$1,200,000	\$1,020,000
Vacates retail space 12-31-94 (one year from now):		
Net retail sales	\$1,920,000	\$1,920,000
Operating expenses	\$1,020,000	\$1,200,000

Disposition of fixed assets:

Evans has decided to sell some of the fixed assets at the time that the store's current retail space is vacated. The net book value of those fixed assets now is \$100,000, and will be \$80,000 one year from now. Evans estimates that the fixed assets can be sold either now or one year from now for about \$130,000.



APPENDIX B
Resource Allocation Case in the Personal Context

Andrew, Henderson & Company
Financial Planning Consultants

MEMORANDUM

DATE: December 26, 1993
TO: Engagement Associate
FROM: Steve James, Partner
SUBJECT: Early job separation of Neil Spencer due to closure of Air Force Base

I have just received the attached letter from Mr. Neil Spencer, a civilian who works at Mather Air Force Base (MAFB), located in Sacramento County, California. Spencer is seeking advice regarding a resource allocation problem related to his future career plans.

Spencer has informed me, via telephone conversation, that he has been working in data processing at the Base since graduating from High School seven years ago. MAFB has been scheduled for closure by the Defense Base Closure and Realignment Commission one year from now (12-31-94); thus, the personnel at MAFB cannot remain in their jobs at the Base beyond the next year.

I have enclosed additional client information compiled by our staff members to assist you in making your recommendation as to whether Neil Spencer should leave his job at MAFB on 12-31-93 (now), or on 12-31-94 (one year from now). I would like to have your recommendation and supporting calculations.

Attachments: Client's letter
Staff memorandum on Spencer's uses and sources of income

Andrew, Henderson & Company
Financial Planning Consultants
12-23-93

Attachment 2

STAFF MEMORANDUM

SUBJECT: Sources and Uses of Income of Neil Spencer
for the Year Ended December 1993

Current Income

Neil Spencer, who has a full-time data processing job at the MAFB, earned a gross salary of \$18,000 this year. According to government officials, no changes of the salary scales, in real terms, are expected for next year.

Although Spencer has never received a formal computer repair training, he also repairs computers at home during his spare time. Spencer uses electronic tools that he acquired 2 years ago at \$48,000. The average useful life of the tools is 5 years using straight line with zero salvage. The cost of the tools was financed in part with a bank loan. Spencer's self-employment income, net of depreciation, averages \$8,400 per year.

Spencer believes in the practice of "saving for rainy days." Therefore, in 1993 he started the practice of investing his excess cash in stocks of the computer corporation owned by his uncle Steve. Spencer earned \$540 this year on an annual average investment of \$3,000. This return is expected to remain constant over the next two years.

Lease Contract and Compensation Award

Four years ago Spencer signed a 10-year transferable, noncancelable lease for his 800 square-foot condominium at \$800 per month. Due to a recent earthquake, there is shortage of apartments in the area; thus, lease renewals are currently running at about \$1,200 per month for an 800 square-foot condominium.

Since the government will be unable to fulfill its job contract with Spencer, it has offered to pay him an early-separation compensation award of \$30,000 if Spencer chooses to leave his job now. If, on the other hand, Spencer chooses to leave his job one year from now, the compensation award that he will receive one year from now will amount to \$32,000.

If Spencer chooses to leave his job now and enroll in the one-year computer repair program, he would sublease his condominium to a third party for the next two years at the market rate. If, on the other hand, Spencer chooses to leave his job one year from now, he would sublease his condominium to a third party for just 1995.

Financing

To help with financing for the purchase of some of his electronic tools, Spencer obtained from Sacramento Central Bank a loan of \$20,000. The loan is guaranteed by Spencer's uncle. The annual interest (\$2,400) is due annually; the principal is due three years from now.

Prospects for the Next Two Years (1994 and 1995)

Projected annual sources of funds:

Given the imminent closure of MAFB, Spencer has accepted work in Uncle Steve's computer company on a part-time basis immediately upon getting a computer repair training certificate. Uncle Steve has offered Spencer a starting annual salary of \$18,000. The cost of the one-year computer repair program in which Spencer has decided to enroll is estimated at \$4,500, and will be paid in full, in advance, by the government regardless of the early-separation date chosen by Spencer. According to Spencer, all of his cost-of-living expenses are expected to remain unchanged in real terms for the next two years. Spencer plans to continue repairing computers at home while at school and thereafter. He expects to earn about the same annual average self-employment income net of depreciation that he is currently earning. The following table summarizes Spencer's projected annual sources of funds for 1994 and 1995 for the two options under consideration:

Projected Annual Salary and Net Self-Employment Income for 1994 and 1995

	<u>1994</u>	<u>1995</u>
Leaves job 12-31-93 (now):		
Gross salary	\$0	\$18,000
Net Self-employment income	\$8,400	\$8,400
Leaves job 12-31-94 (one year from now):		
Gross Air Force salary	\$18,000	\$0
Net Self-employment income	\$8,400	\$8,400

Disposition of electronic tools:

Spencer has decided to sell some of his tools at the time he enrolls in school. The net book value of those tools now is \$10,000, and will be \$8,000 one year from now. Spencer estimates that the tools can be sold either now or one year from now for about \$13,000.

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Option Pricing-Based Bond Value Estimates and a Fundamental Components Approach to Account for Corporate Debt

Mary E. Barth

Stanford University

Wayne R. Landsman

Richard J. Rendleman, Jr.

University of North Carolina at Chapel Hill

ABSTRACT: This study provides evidence on the relevance and reliability of option pricing-based value estimates for bonds and their components, i.e., conversion, call, put and sinking fund features. Findings reveal component value estimates represent large fractions of bond par value, and a fundamental components approach to account for corporate debt results in key financial statement amounts significantly different from those presently recognized. Component value estimates and financial statement amounts vary significantly with component estimation order. Thus, bond value estimates potentially meet the FASB's relevance criterion. However, estimate variation across component estimation orders and comparisons of estimates to available benchmarks indicate bond value estimates lack reliability.

Keywords: *Financial Instruments, Option pricing, Corporate debt, Conversion, call, put and sinking fund features, Fundamental components.*

Data Availability: *Data are obtainable from public sources.*

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I. INTRODUCTION

THE use of compound financial instruments has increased dramatically in recent years. This has led the Financial Accounting Standards Board (FASB) and other accounting standard setters to consider separate recognition or disclosure of fair values of the primitive components embedded in compound financial instruments (FASB 1990a, 1991b; Canadian Institute of Chartered Accountants 1995; International Accounting Standards Committee 1995). These components often have option-like characteristics and the FASB offers option pricing as one approach for estimating component values. This study uses an option pricing approach to estimate the fair values of corporate debt, one compound financial instrument, and its components. Specifically, we estimate values for straight debt and conversion, call, put and sinking fund features. Our objective is to assess relevance and reliability of the option pricing-based value estimates for bonds and these common bond features because relevance and reliability are the two principal criteria the FASB uses for choosing among accounting alternatives.

We assess relevance, in part, by determining whether estimated values for bond features other than straight debt comprise a material portion of bond par value. We also assess relevance by determining whether key financial statement amounts are affected by using the estimates in an implementation of the FASB's fundamental components approach (FASB 1990a) to account for corporate debt. In particular, we calculate firms' total assets, liabilities, equity and debt-to-equity ratios classifying conversion features as equity, call features as assets, put features and straight debt as liabilities, and sinking fund features as assets or liabilities depending on whether estimated values are negative or positive.

Relevance and reliability of financial statements based on a fundamental components approach for debt can be affected by differences in bond component value estimates across estimation orders. That is, the estimated value of a given bond feature can differ depending on the subset of the bond's other features on which the feature's value estimate is conditioned. Although option pricing theory indicates that component values can be order-dependent, there is little empirical evidence on whether the estimates vary significantly across estimation orders. We estimate component values using all possible estimation orders and present empirical evidence on whether resulting component value estimates and related financial statement amounts differ materially.

Relating to relevance, we find that estimated conversion, call, put and sinking fund component values represent a material portion of bond par value, and are sensitive to estimation order. Most notably, call and conversion features significantly affect each other's value estimates, and both affect significantly the put feature's value estimates. Furthermore, implementing a fundamental components approach for recognizing debt results in financial statement amounts and debt-to-equity ratios that are significantly different from those recognized under current generally accepted accounting principles (GAAP). Moreover, financial statement amounts and debt-to-equity ratios differ significantly depending on bond component value estimation order. Taken together, these findings suggest that the total bond and component value estimates are relevant. Contracts based on financial statement amounts and/or the information conveyed to shareholders by financial statements could be significantly affected if the FASB requires a fundamental components approach to account for corporate debt using option pricing-based value estimates. However, because key financial statement amounts differ significantly depending on bond component value estimation order, financial statements based on a fundamental components approach for debt may lack reliability.

Next, we provide evidence relating specifically to reliability of bond value estimates. The evidence is indirect because most bonds, and particularly their components, are not

traded in active markets. First, for the subset of publicly traded bonds, we compare market values and estimates of total bond value, i.e., the value of a bond including all of its features. We find that mean total bond value estimates are statistically indistinguishable from mean market values, indicating that bond value estimates are reliable. However, finding estimated bond values close to market values for the subset of publicly traded bonds could be attributable to using bond market values in implementing our primary bond value estimation procedure. Second, using all sample bonds, we reestimate total bond and component values using a variation of the estimation procedure that does not use traded bond prices. Comparisons of estimates from the two variations of the estimation procedure reveal significant differences. Because both sets of estimates are based on a common estimation procedure, the significant differences suggest that option pricing-based bond value estimates may lack reliability. Third, we compare the equity volatility estimates derived from the estimation procedure to three market-based estimates of future equity volatility. We find that historical and one-year-ahead equity volatility and equity volatility implied by prices of traded call options on a firm's common stock are similar, but are only half as large as the equity volatility estimate derived from the estimation procedure. These findings also suggest that option pricing-based bond value estimates may not be reliable. However, despite the potential reliability problems associated with option pricing-based bond value estimates, the financial statement effects from implementing a fundamental components approach are material using either set of bond value estimates.

The remainder of this paper is organized as follows. The next section describes the financial reporting issues that motivate the study and relates it to prior research. Section III provides an overview of the bond value estimation procedure and explains bond component value estimation. Section IV describes sample data. Section V presents evidence relating to the magnitude of component value estimates and the effects on financial statement amounts of implementing a fundamental components approach for debt based on the estimates. Section VI reports evidence from comparisons of selected estimates to available benchmarks. Section VII provides a summary and concluding remarks.

II. FINANCIAL REPORTING FOR FINANCIAL INSTRUMENTS AND PRIOR RESEARCH

Financial Reporting for Financial Instruments

The FASB recently has issued several standards requiring recognition or disclosure of fair values of financial instruments, including Statements of Financial Accounting Standards (SFAS) Nos. 105 (FASB 1990b), 107 (FASB 1991a), 115 (FASB 1993), 119 (FASB 1994) and 123 (FASB 1995). The FASB's definition of financial instruments (FASB 1991a) includes not only derivative financial contracts, e.g., interest rate swaps, but also many recognized assets and liabilities.

The FASB indicates that for traded financial instruments, market prices represent the best estimate of fair values (FASB 1991a). However, because many financial instruments are not actively traded, market prices for them are not available, necessitating estimation of their values. Because many financial instruments have explicit or imbedded options, the FASB offers option pricing as an approach for estimating fair values.¹ Yet, the standards provide little guidance concerning implementation of methods to estimate financial instruments' fair values. For example, in SFAS No. 107 (FASB 1991a), the FASB

¹ Other alternatives include discounted cash flow and matrix pricing models. The FASB describes (FASB 1990a, paras. 66–67) methods used by investment bankers in valuing corporate debt which are substantially less comprehensive than those used here, although there is no way of determining all possible methods used in practice.

mandates disclosure of fair value estimates of all financial instruments, but the standard provides little direction concerning estimation techniques. Similarly, although SFAS No. 123 (FASB 1995) requires an option pricing approach to measure stock-based compensation expense, the standard only provides broad guidance relating to assumptions required for its implementation.

FASB Discussion Memoranda (DM) relating to financial instruments (FASB 1990a, 1991b) indicate that the FASB also is considering requiring disclosure or differential recognition of the values of the primitive components that comprise compound financial instruments. The FASB refers to differential recognition of compound financial instruments' components as a "fundamental components" approach. Under this approach, components with asset, liability or equity characteristics are recognized as assets, liabilities or equity, respectively.

Throughout the DMs, the FASB uses corporate debt as an example to illustrate the techniques under consideration for estimating fair values of compound financial instruments and their components, which are necessary for implementing a fundamental components approach. For example, in *Distinguishing Between Liability and Equity Instruments and Accounting for Instruments with Characteristics of Both* (FASB 1990a, para. 27), the FASB raises the question "[h]ow feasible would it be to measure the option component of convertible debt using convertible debt pricing models?" In *Recognition and Measurement of Financial Instruments* (FASB 1991b, para. 53), the FASB asks "[h]ow should a financial instrument be analyzed for accounting purposes if two or more rights or obligations having different characteristics are embedded in a single contract—for example, a callable bond?" An implementation of the fundamental components approach for recognizing debt would classify, for example, the values of straight debt as a liability, conversion features as equity, and call features as assets. Whatever implementation of the fundamental components approach the FASB ultimately adopts, a pricing model is necessary to estimate fair values of non-traded debt features, e.g., conversion, call, put and sinking fund provisions, even if a bond is publicly traded and its fair value can be estimated using its market price.²

In its DM, *Recognition and Measurement of Financial Instruments* (FASB 1991b, para. 6.74b), the FASB suggests estimating debt component values using the with-and-without method. Under the with-and-without method, a component's value is the difference between the estimated values of the complete compound instrument, using whatever estimation approach the firm selects, and an otherwise equivalent instrument that does not include the component being valued. Thus, the with-and-without method assigns to a particular bond component only its incremental contribution to total bond value after considering the aggregate value of all of the bond's other features. As an example of this method, the FASB uses a convertible, callable bond. To estimate the value of the conversion feature, the issuer estimates the value of the bond and the value of a non-convertible, callable bond with otherwise identical terms. The difference between these two estimated values is the value of the conversion feature under the with-and-without method.

The FASB is not the only standard-setting body considering implementing a fundamental components approach to measuring corporate debt. As a partial implementation, the

² This study focuses on estimating values of conversion, call, put and sinking fund features in addition to straight debt because documents issued by accounting standard setters focus on these institutional bond features. Theoretically, corporate debt and its components can be expressed as the sum of two basic components, riskless debt and equity (Merton 1974). However, it is unlikely that financial statement recognition will ignore institutional features of corporate debt and be limited to riskless debt and equity. Thus, we make no attempt to recast financial statements in terms of riskless debt and equity.

International Accounting Standards Committee (IASC) and the Canadian Accounting Standards Board (CASB) have recently issued standards that require separate recognition of financial instruments' debt and equity components, beginning with December 1996 financial statements (IASC 1995; CICA 1995). Both standards implement a fundamental components approach for recognizing debt by requiring that the conversion and straight debt components of bonds be included as part of equity and liabilities, respectively. However, both standards ignore separate recognition of other bond components, e.g., call, put and sinking fund features. Neither standard prescribes a particular method for component value estimation, although both list as one alternative an option pricing approach similar to that implemented here.

Relation to Prior Research

Corporate debt has been the subject of previous finance research in the option pricing literature (e.g., Black and Scholes 1973; Merton 1974; Galai and Masulis 1976; Brennan and Schwartz 1977, 1979, 1980; Ingersoll 1977a, 1977b; Cox et al. 1979; Rendleman and Bartter 1979; Jones et al. 1984, 1985; McConnell and Schwartz 1986). These studies provide a foundation on which to build our estimation procedure. However, studies using option pricing approaches to estimate debt component values (e.g., Jones et al. 1984, 1985; McConnell and Schwartz 1986) focus estimation on selected firms and bonds. In contrast, because accounting standards apply to all firms and bonds, we focus on estimation of total bond and component values for a large sample of firms with multiple bonds having multiple features. Moreover, the finance studies do not directly address issues relating to financial statement recognition of debt and its components.

Several studies examine relevance and reliability of disclosed financial instrument fair value estimates using equity share price association tests. For example, Barth et al. (1996) Eccher et al. (1996) and Nelson (1996) find value-relevance of SFAS No. 107 (FASB 1991a) fair value estimates for a variety of bank financial assets and liabilities, but not consistently for long-term debt. Barth (1991) uses an equity share price association approach and a measurement error model to compare the relevance and reliability of several pension asset and liability measures disclosed under SFAS No. 87 (FASB 1985). In contrast, this study assesses (1) relevance by determining whether financial statement amounts are changed materially by application of a fundamental components approach for one balance sheet account, debt, and (2) reliability by comparing bond value estimates to market prices directly; by determining how sensitive bond value estimates and financial statement amounts are to a permutation of the estimation procedure; and by comparing another estimate derived from the estimation procedure, equity volatility, to market-based estimates.

Only a few prior studies specifically address questions relating to accounting for corporate debt and its components. Most such studies, including Ford (1969), Swieringa and Morse (1985) and King and Ortengren (1988), are descriptive with normative conclusions (see Cheung (1991) for a review). However, Kimmel and Warfield (1995) examine empirically the relation between firm leverage and systematic risk to determine whether redeemable preferred stock is economically valued as debt or equity. In contrast to our study, none of these studies estimates values for corporate debt and its components nor provides evidence on relevance or reliability of financial statements based on differential recognition of debt components.

III. ESTIMATION OF BOND VALUES

Estimation Procedure Overview

An appendix, available from the authors upon request, describes in detail the estimation procedure, including the assumptions necessary for its implementation, specifies the bond

valuation equations the procedure solves, and provides a numerical example illustrating how the estimation procedure works. Here we provide an overview.

The value of a given bond reflects the values associated with several potential actions of bondholders and the firm. These actions include calling the bond, selling the bond back to the firm through a put provision, converting the bond to common stock, and making sinking fund payments. Conversion and put features are options of bondholders, and thus increase bond value. Call features are options of the firm, and thus decrease bond value. Sinking fund provisions are similar to call options on a portion of the bond, but they also serve to reduce bondholder risk. As a result, the impact of sinking fund provisions on bond value is not predictable. In addition, the limited liability nature of debt contracts gives the firm the option to default on the bond when it is in the stockholders' interest to do so. The estimation procedure, which is based on the binomial option-pricing model (Cox et al. 1979; Rendleman and Bartter 1979), incorporates the potential for these actions in estimating bond and component values.

The estimation procedure is designed to solve for values of the firm's bonds and total capital, which is the sum of the firm's debt and equity. The procedure uses as inputs details regarding each bond (i.e., maturity, coupon schedule, priority, and features and their terms), the firm's assumed dividend payout ratio, and a term structure of risk-free interest rates. Initially, we develop a binomial tree of the firm's total capital from the date at which we estimate bond values, time zero, until the maturity date of the firm's longest-term bond.³ We construct the binomial tree using the above inputs, together with initial estimates of total capital and total capital volatility based on the firm's time zero market value of equity, book value of liabilities, and historical equity volatility. Next, the inputs are used to estimate bond values in each binomial period, recursively backward in time, until time zero. Then, we determine whether the time zero estimated bond and equity values meet the estimation procedure's termination criterion.

Following Manaster and Rendleman (1982), the estimation procedure terminates when the sum of squared deviations between market and estimated values of the firm's equity and its publicly traded bonds is minimized. The procedure's estimated equity value is the difference between estimated total capital and estimated values of the firm's bonds. Bond and equity market values are those observed at time zero. Because the estimation procedure has more equations, some of which are nonlinear, than unknowns, the time zero bond and equity value estimates may not satisfy the procedure's termination criterion. If the termination criterion is not satisfied, a new binomial tree of the firm's total capital is developed by choosing new estimates of total capital and total capital volatility. This process continues until the termination criterion is met.

Our estimation procedure has two advantages relative to other commonly employed procedures, e.g., Black and Scholes (1973). First, our estimation procedure does not restrict estimated equity volatility to equal a predetermined amount. Estimates of equity volatility are a key by-product of our estimation procedure and can reflect dimensions of bond value not explicitly incorporated into the estimation procedure, e.g., interest rate risk. In section VI, we use the equity volatility estimates to provide indirect evidence on the reliability of bond value estimates. Second, because our termination criterion uses traded bond prices,

³ In the first binomial time period, the tree reflects the possibility that a firm's total capital can increase in the up state or decrease in the down state. In each successive time period and state, the tree similarly reflects the possibility that total capital can increase or decrease. The tree is constructed so that the firm's total capital value is path-independent. This means, for example, that total capital after one up and one down state equals total capital after one down and one up state. The extent to which total capital at each node in the tree differs between the up and down states is determined by total capital volatility.

bond value estimates can incorporate information reflected in these market prices, thereby potentially improving accuracy of the estimates. However, the procedure has a disadvantage in that the termination criterion limits the applicability of the estimation procedure to firms with at least one publicly traded bond.⁴

It is important to note that the bond value estimation procedure does not explicitly incorporate market interest rate risk. In principle, market interest rate risk can affect values of all bond features. However, estimated call feature values are likely to be particularly affected because declines in market interest rates increase the likelihood that a firm finds it optimal to call the bond, i.e., increase the value of the firm's option to call the bond. Interest rates applicable to a firm's bonds also are affected by the firm's default risk, which the estimation procedure explicitly incorporates. It is computationally infeasible to incorporate both default and interest risk in the estimation procedure. The likely effect of not incorporating market interest rate risk in the estimation procedure is a downward bias on the magnitude of estimated call values.⁵ However, evidence presented below indicates that this potential bias does not interfere with the ability of the estimation procedure to provide information about the interdependence of conversion and call feature values.

Estimation of Bond Component Values

Option pricing theory shows that for a bond with multiple features, the features' values are interdependent. That is, each component's incremental contribution to total bond value depends on which features are before it in a particular estimation order. The interdependence arises because when there are different types of options held by parties with conflicting interests, the presence of each conflicting option affects the value of the others. For example, the bondholders' option to convert a bond into equity is less valuable when the firm has the option to call the bond than when it does not have this option. Thus, component value estimates can depend on estimation order. However, for any particular estimation order, the sum of estimated values for straight debt and each bond feature equals total bond value, which is invariant to estimation order.

The estimated value of a given component's value is the difference between the estimated values for two bonds. The first, BOND1, has the feature being valued, as well as the bond's other features that come before the feature being valued in the particular estimation order being considered. The second, BOND2, includes the other features, but excludes the feature being valued. The component's estimated value is the value of BOND1 minus the value of BOND2. For example, for a bond with all four features—conversion (V), call (C), put (P), and sinking fund (S)—and for the estimation order CPSV, the value of the conversion feature equals estimated total bond value minus the estimated value of the bond with only its call, put and sinking fund features. The estimated value of the sinking fund feature equals the value of the bond with only its call, put and sinking fund features minus the estimated value of the bond with only its call and put features. The estimated value of the put feature equals the value of the bond with only its call and put features minus the estimated value of the bond with only its call feature. Finally, the estimated value of

⁴ To investigate the effects of this limitation on our findings, in section VI we also estimate bond and component values using an estimation procedure termination criterion that does not require a firm to have publicly traded bonds.

⁵ If market interest rates at December 31, 1990, our bond valuation date, were relatively high, there would be a greater likelihood that market interest rates would decline than if they were relatively low. The ten-year Treasury bond rate of December 1990 was 8.41 percent, a decline from 9.52 percent as of December 1988. However, as of December 1991, it had fallen further to 7.59 percent. To the extent that the market anticipated the decline after December 1990, our call value estimates may be understated.

the call feature equals the value of the bond with only its call feature minus the estimated value of the bond with no features beyond straight debt. We repeat this process to estimate bond component values for each estimation order. We include the value of the default option in the value of a bond's straight debt component.

Under the FASB's with-and-without method, each bond feature's value is estimated using an estimation order in which the feature is last. For example, for a convertible and callable bond, the with-and-without estimated conversion feature value is the difference between the estimated value of the total bond and the estimated value of the bond with only its call feature. Similarly, the with-and-without estimated call feature value is the difference between the estimated value of the total bond and the estimated value of the bond with only its conversion feature. Hence, for this convertible and callable bond, the with-and-without method uses two different estimation orders, i.e., CV and VC, to estimate the conversion and call features' values. Because of feature value-interdependence, component values estimated using different estimation orders do not necessarily sum to total bond value, i.e., they are not necessarily additive. The with-and-without method does not assign to any particular component the value attributable to interdependence among the bond's features. As a result, arbitrary assignment of joint feature value is necessary for component values to sum to total bond value.

Because the with-and-without method requires arbitrary assignment of joint feature value, under a fundamental components approach implemented using the with-and-without method two otherwise equivalent firms can have materially different balance sheets if they make different arbitrary assignments of joint feature value. Hence, financial statement recognition based on with-and-without bond component values potentially can result in financial statements that lack relevance and reliability. Even if a fundamental components approach is implemented based on single estimation order for bond component values, if firms are permitted to choose the order, financial statements also can lack relevance and reliability because two otherwise equivalent firms can have materially different balance sheets if they choose different orders. However, even the FASB mandating a particular estimation order will not necessarily result in relevant and reliable financial statements because the choice of a particular estimation order is arbitrary, and the use of any single estimation order generally cannot provide complete information about bond feature value-interdependence.

In section V, we estimate component values using all possible estimation orders, including those associated with the with-and-without method, and provide empirical evidence that component value estimates and financial statement amounts are materially dependent on estimation order.

IV. SAMPLE AND DESCRIPTIVE STATISTICS ON BOND FEATURES

Bond values for sample firms are estimated as of December 31, 1990. Sample firms: (1) are publicly traded and incorporated in the U.S., (2) have December 31 fiscal year-ends, (3) have a ratio of convertible securities to total debt plus total preferred stock in excess of ten percent, (4) are not financial institutions (SIC 6000-6399, 6700-6734) or utilities (SIC 4900-4999), (5) are included in the Moody's Bidsplus database, and (6) have at least one publicly traded bond. Application of the first criterion results in a potential sample of 9,596 firms. Sequential application of the second through fifth criteria and data limitations reduce the potential sample to 4,372, 398, 356, 141, and 139 firms, respectively. Requiring

sample firms to have at least one publicly traded bond eliminates 19 firms, resulting in a final sample of 120 firms.⁶

The first criterion is imposed because the estimation procedure's termination criterion includes the firm's market value of equity and to facilitate data collection, including bond details used by the estimation procedure. In contrast to other financial instruments, much of the information necessary to implement an option pricing approach to estimate bond values is publicly available.⁷ The second criterion is imposed because measuring all bond and stock price and interest rate information as of a single date simplifies implementation of the estimation procedure, e.g., we need include only a single interest rate term structure for all bonds and firms.⁸ However, use of a single date for bond value estimation may limit the generalizability of our findings to time periods with different economic conditions.

The third criterion attempts to identify firms with a relatively large proportion of bonds that include at least one of the four option features we value. Because Compustat identifies only convertible bonds, the actual percentage of sample firms' bonds with conversion, call, put or sinking fund features exceeds ten percent. The estimation procedure does not include effects of regulation on bond and equity values, so the fourth criterion eliminates firms in regulated industries. The fifth criterion reflects the fact that details necessary to implement the estimation procedure, including call, put, conversion and sinking fund schedules, interest rates and maturity dates, are not on Compustat, but largely are obtainable from the Moody's Bidsplus database. For bonds not included in Bidsplus, data items are hand-collected from firms' annual reports and Forms 10K, or Moody's *Industrials Manual*. Remaining data items required for estimation are from Compustat and the *Wall Street Journal*.

The 120 sample firms have a total of 913 bonds, with a mean, median and range of 6.5, 5 and 1 to 28 per firm. As noted in footnote 7, some information necessary to estimate values for more than half of the 913 bonds is not publicly available. However, the estimation procedure considers these bonds when valuing the firm's remaining bonds. We estimate total bond and component values for 430 bonds.⁹

Table 1 presents the number and total book value for the sample bonds. We present separate statistics for bonds with different combinations of features. Table 1 reveals that 60.5 percent of the bonds possess at least one feature in addition to straight debt, 57.1 (17.2+8.6+0.5+13.0+3.3+14.5) percent have call options, 29.4 (2.6+8.6+0.2+0.2+3.3+14.5) percent have conversion features, 27.9 (0.2+0.2+13.0+14.5) percent have sinking fund requirements, and only 4.2 (0.2+0.2+0.5+3.3) percent have put features. Viewed in terms of percentage of total book value of the bonds we value, the analogous percentages are 62.1, 60.9, 26.3, 27.1 and 8.1. Table 1 also reveals that 40.3 (8.6+0.2+0.2+0.5+13.0+3.3+14.5) percent of the sample bonds have multiple features, with 22.5 (8.6+0.2+0.2+0.5+13.0) percent having two and 17.8 (3.3+14.5) percent having three,

⁶ When we calculate bond values in section VI using the alternative termination criterion, we relax the requirement that a sample firm have at least one publicly traded bond.

⁷ However, even for corporate debt, disclosures are not uniformly sufficiently detailed for us to implement an option pricing approach for all bonds. As described below, we can estimate values for only approximately one-half of the sample firms' bonds. However, those that we cannot value, primarily because of aggregated disclosure, comprise almost exclusively straight debt.

⁸ We estimate bond values as of a single calendar date rather than at each bond's date of issuance because the estimation procedure jointly estimates values of all of a firm's bonds at a given point in time. Estimating the value of a particular bond at its issuance date would require estimating values for all of a firm's bonds at all applicable issuance dates. Moreover, at all balance sheet dates, not just date of issue, SFAS No. 107 (FASB 1991a) requires disclosure of fair value estimates of all financial instruments, and the FASB is considering requiring recognition at fair value of all financial instruments, including bonds and their components.

⁹ When we estimate bond values using the alternative termination criterion that does not require sample firms to have publicly traded bonds in section VI, the sample increases to 457 bonds.

TABLE 1
Descriptive Statistics for Sample Bonds

<i>Feature Combinations</i>	<i>Bonds</i>		<i>Book Value</i>	
	<i>Number</i>	<i>%</i>	<i>\$ Millions</i>	<i>%</i>
Straight debt only	170	39.5	13,070	37.9
Conversion only	11	2.6	78	0.2
Call only	74	17.2	7,193	20.8
Put only	1	0.2	100	0.3
Sinking fund only	1	0.2	2	0.1
Conversion and call only	37	8.6	2,034	5.9
Conversion and put only	1	0.2	180	0.5
Conversion and sinking fund only	1	0.2	68	0.2
Call and put only	2	0.5	66	0.2
Call and sinking fund only	56	13.0	5,017	14.5
Conversion, call and put only	14	3.3	2,433	7.0
Conversion, call and sinking fund only	62	14.5	4,277	12.4
Total	430	100.0	34,518	100.0

Sample bonds are from 120 publicly traded Compustat firms in 1990 for which sufficient data are available to estimate bond and component values using an option pricing-based estimation procedure. Conversion, call, put, and sinking fund features are in addition to straight debt.

although no bond has all four. In addition, 26.4 (8.6+3.3+14.5) percent of the sample bonds are both callable and convertible. As will be shown below, among all feature combinations, the order in which these two components appear in the estimation order has the greatest effect on their estimated values and related financial statement amounts.

V. COMPONENT VALUE ESTIMATES AND FINANCIAL STATEMENT AMOUNTS

This section provides evidence relating to the relevance of implementing a fundamental components approach for debt. First, in table 2, we present estimates of bond component values using all possible estimation orders and show that bond component values comprise a material portion of bond par value. Second, in table 3, we present estimates of assets, liabilities and equity under a fundamental components approach and show that adopting such an approach materially affects financial statement amounts. These findings indicate that a fundamental components approach to valuing debt produces potentially relevant information. However, table 3 provides evidence that financial statement amounts significantly differ using component value estimates from the alternative estimation orders, suggesting that financial statements based on a single estimation order may lack relevance and reliability.

Descriptive Statistics for Bond Component Value Estimates

Table 2, panel A, presents mean and median bond component value estimates under alternative estimation orders. For each feature being valued, table 2, panel B, indicates

TABLE 2
Bond Component Value Estimates Based on Alternative Estimation Orders

Panel A: Mean and Median Bond Component Value Estimates*

<i>Estimation Order</i>	<i>Feature Being Valued</i>					
	<i>Conversion (V)</i>		<i>Call (C)</i>		<i>Put (P)</i>	
	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>
Feature valued first	29.70	21.14	-0.80	0.00	29.85	29.24
Feature valued second after:						
conversion	†	†	-8.96	-4.58	19.06	15.87
call	17.55	9.51	†	†	24.39	22.26
put	28.10	19.90	-1.34	0.00	†	†
sinking fund	28.78	20.28	-0.93	-0.02	*	*
Feature valued third after:						
call and put	15.84	8.28	†	†	†	†
conversion and put	†	†	-9.59	-5.66	†	†
conversion and sinking fund	†	†	-8.73	-4.95	*	*
call and sinking fund	17.18	9.51	†	†	*	*
Feature valued last	15.46	7.86	-9.35	-5.66	12.78	10.21
<i>n</i>	115		171		17	
					119	

(Continued on next page)

TABLE 2 (Continued)
Panel B: Significant Differences in Mean Component Value Estimates Across Estimation Orders Reported in Panel A^b

Feature Being Valued			
Conversion (V)	Call (C)	Put (P)	Sinking Fund (S)
All except PVXX vs. SVXX (20 of 21)	All except PCXX vs. SCXX PCXX vs. CXXX VCXX vs. XXXC VPCX vs. VCXX VSCX vs. XXXC (16 of 21)	All except PXXX vs. CPXX VPXX vs. CPXX (4 of 6)	All (6 of 6)

Estimates are based on an option pricing-based estimation procedure. The sample bonds are those with more than one feature in addition to straight debt from 107 publicly traded Compustat firms in 1990.

† Not applicable because a feature cannot be valued after itself.

* No sample bond has put options and sinking fund provisions making the * value estimates not applicable.

n denotes the number of valued bonds with the particular feature.

* All numbers are expressed as a percentage of bond par value.

^b In panel B, an "X" denotes a feature other than those specified in a particular ordering. For example, in the conversion feature column below, "all except PVXX versus SVXX" denotes that all mean conversion component value estimates differ significantly from one another, except those relating to estimation orders in which the conversion feature is second after the put feature versus estimation orders in which the conversion feature is second after the sinking fund feature. The numbers in parenthesis indicate how many mean differences in panel A are significantly different from one another (at the 0.05 probability level).

TABLE 3
Financial Statement Effects of Implementing a Fundamental Components Approach to Account for Corporate Debt

	Assets		Liabilities		Equity		Debt-to-Equity Ratio	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Book value	1,647.49	588.07	838.05	297.07	809.44	225.85	0.92	0.62
Fair value	NA	NA	801.03	280.23	846.46	242.13	0.66	0.47
Change							-0.26	-0.09
Percentage change	NA	NA	-8.00	-7.00	24.00	7.00		
t-statistic	NA	NA	-7.07		3.27		-3.90	

In panel A, changes are $FV - BV$ and percentage changes are $[(FV - BV)/BV]$ times 100.

(Continued on next page)

TABLE 3 (Continued)
Panel B: Percentage Differences (Differences) in Assets, Liabilities and Equity (Long-Term Debt-to-Equity Ratio)

Estimation Order	Assets		Liabilities		Equity		Debt-to-Equity Ratio	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
VPCS	1.91	0.96	-4.59	-1.50	10.86	4.22	-0.12	-0.04
VPCS	1.98	1.15	-4.38	-1.46	*	*	-0.12	-0.04
VSCP	1.91	1.01	-4.60	-1.48	*	*	-0.12	-0.04
VPSC	1.98	1.17	-4.38	-1.42	*	*	-0.12	-0.04
CVPS	0.13	0.02	*	*	6.34	2.12	-0.10	-0.03
PVCS	*	*	-4.09	-1.41	10.51	4.17	-0.12	-0.04
SVCP	1.83	0.97	-4.46	-1.41	10.56	4.08	-0.12	-0.04
PVSC	*	*	-4.09	-1.42	*	*	-0.12	-0.04
SVPC	1.90	1.14	-4.25	-1.38	*	*	-0.12	-0.04
CPVS	*	*	-4.20	-1.41	5.98	1.59	-0.10	-0.02
CSVP	0.13	0.02	-4.48	-1.45	6.23	1.97	-0.10	-0.03
PCVS	0.18	0.02	*	*	*	*	-0.09	-0.02
SCVP	0.14	0.02	*	*	*	*	-0.10	-0.03
PSVC	*	*	-3.96	-1.29	10.21	4.02	-0.11	-0.03
CPSV	*	*	-4.09	-1.31	5.86	1.35	-0.09	-0.02
PCSV	0.18	0.02	-3.98	-1.31	*	*	-0.09	-0.02
SCPV	*	*	-4.07	-1.29	*	*	-0.09	-0.02
PCSV	0.19	0.02	*	*	*	*	-0.09	-0.02
Number significantly different from each other	53/66		61/91		26/28		112/153	

In panel B, columns relating to assets, liabilities, and equity are [(FC - FV)/FV] times 100 and columns relating to the debt-to-equity ratio are FC - FV.

Panel C: Percentage Differences in Liabilities, Equity and the Long-Term Debt-to-Equity Ratio

Order	Liabilities		Equity		Debt-to-Equity Ratio	
	Mean	Median	Mean	Median	Mean	Median
VCPS	-12.54	-9.12	35.83	19.20	-0.39	-0.18
VPCS	-12.39	-8.90	*	*	-0.39	-0.18
VSCP	-12.54	-9.12	*	*	-0.39	-0.18
VPSC	-12.39	-8.91	*	*	-0.39	-0.18
CVPS	*	*	31.09	12.96	-0.37	-0.16
PVCS	-12.18	-8.73	35.22	19.20	-0.38	-0.18
SVCP	-12.42	-9.12	35.50	18.51	-0.39	-0.17
PVSC	-12.18	-8.68	*	*	-0.38	-0.18
SVPC	-12.27	-8.60	*	*	-0.38	-0.17
CPVS	-12.28	-8.90	30.48	12.96	-0.36	-0.16
CSVP	-12.44	-9.12	30.96	12.96	-0.37	-0.15
PSVC	-12.06	-8.60	34.89	18.51	-0.38	-0.17
CPSV	-12.18	-8.60	30.35	12.96	-0.36	-0.15
PCSV	-12.08	-8.60	*	*	-0.36	-0.15
SCPV	-12.16	-8.60	*	*	-0.36	-0.15

* Denotes that estimation order does not result in amounts that differ from those of other estimation orders.

Debt-to-equity ratios are based on the 104 firms for which book value and fair value of equity are positive.

To implement the fundamental components approach, estimated values of conversion features (V) are classified as equity, call features (C) as assets, put features (P) and straight debt as liabilities, and sinking fund features (S) as assets or liabilities depending on whether their estimated values are negative or positive. Estimates are from an option pricing-based estimation procedure. The sample is 107 publicly traded Compustat firms in 1990 that have bonds with more than one feature in addition to straight debt. Estimation order refers to alternative bond component value estimation orders.

BV denotes bonds are recognized at book value.

FV denotes bonds are recognized at the procedure-estimated total bond fair value, i.e., the value of a bond including all of its components.

FC denotes bonds recognized based on a fundamental components approach.

In panel C, columns relating to liabilities and equity are $[(FC - BV)/BV]$ times 100 and columns relating to the debt-to-equity ratio are $FC - BV$.

which mean component value estimates differ significantly from one another.¹⁰ For example, for the first column in panel B, i.e., the column relating to mean conversion value estimates, "all except PVXX vs. SVXX" denotes that all mean conversion value estimates differ significantly from one another, except those relating to estimation orders in which the conversion feature is second after the put feature vs. estimation orders in which the conversion feature is second after the sinking fund feature. To facilitate comparison across bonds, all estimates are stated as percentage of par value. All table 2 statistics exclude bonds that have only one feature in addition to straight debt because for such bonds, there is effectively only one estimation order for valuing the feature.¹¹

Table 2, panel A, reveals that mean and median component value estimates have signs consistent with option pricing theory, thereby providing evidence on the estimation procedure's basic validity. In fact, untabulated findings indicate that the signs of component value estimates for every bond are consistent with option pricing theory. All mean and median estimated conversion and put values are positive, which is consistent with these two features being options of bondholders, thus increasing bond value. Similarly, because call features represent options of the firm, as expected, all mean and median call values are negative. Mean and median sinking fund feature values are positive, indicating that, on average for the sample bonds, the net effect of a sinking fund feature is reduction of bondholder risk and, thus, an increase to bond value.

Estimated conversion values are large fractions of bond par value regardless of estimation order. Table 2, panel A, reveals that mean (median) conversion values range from 15.46 (7.86) percent for estimation orders in which the conversion feature is last to 29.70 (21.14) percent when it is first.¹² The conversion feature's value depends most heavily on whether the conversion feature is before or after the call feature in the estimation order. For example, its mean value ranges from 28.10 to 29.70 percent of total bond par value for estimation orders in which the conversion feature is before the call feature. However, when the conversion feature is after the call feature, the mean conversion value drops to between 15.46 and 7.55 percent. This difference in mean estimated conversion values reflects the fact that the firm's option to call the bond reduces the value of the bondholder's option to convert the bond into equity. That is, by calling the bond, the firm can preempt the bondholders' otherwise optimal conversion of the bond in subsequent periods when the firm's prospects are favorable. Because there are few bonds with put features and the magnitude of estimated sinking fund values is small compared with those of the other features, the presence or absence of put and sinking fund features has little effect on conversion value estimates.

¹⁰ Although there are 24 possible estimation orders, there are at most eight unique component value estimates because some estimation orders are redundant with respect to a particular feature's value. For example, although there are six possible estimation orders in which the conversion feature is first, it has only one estimated value. That is, the value of the conversion feature is the same for each of the following six estimation orders: VCPS, VCSP, VPCS, VPSC, VSPP and VSPC. Because our sample contains no bonds that have both put and sinking fund features, the maximum number of unique component value estimates for each feature is reduced from eight to seven. Throughout, we use a five percent confidence criterion to determine statistical significance.

¹¹ Untabulated mean and median component value estimates for the full sample of bonds, which includes bonds with only one feature in addition to straight debt in addition to bonds with multiple features, are similar to those reported in table 2, panel A.

¹² To investigate the degree to which in-the-money conversion options affect the mean values reported in table 2, we calculated the mean conversion feature value for the estimation order in which the conversion feature is last, excluding the nine bonds with in-the-money conversion options at December 31, 1990. Although, as expected, the mean conversion feature value for the remaining 106 bonds is smaller than that reported in table 2, 11.54 vs. 15.46, it indicates that out-of-the-money conversion feature values represent a large fraction of bond par values.

Table 2, panel B reveals that mean conversion value estimates differ significantly across all estimation orders, except those relating to estimation orders in which the conversion feature is second after the put feature vs. estimation orders in which the conversion feature is second after the sinking fund feature. Of a possible 21 mean conversion value differences, 20 are significant.

In contrast to the conversion feature, table 2, panel A, reveals that estimated call values are only large fractions of bond par value for estimation orders in which the call feature is after the conversion feature. For estimation orders in which the call feature is before the conversion feature, mean and median absolute call values are less than 1.5 percent of bond par value. These relatively small mean and median call value estimates could be attributable to the bias induced by not explicitly incorporating in the estimation procedure market interest rate risk. However, for estimation orders in which the call feature is after the conversion feature, the mean (median) absolute call value estimate increases to between 7.08 and 9.59 (2.48 and 5.66) percent of bond par value. These mean and median call value estimates indicate that the presence of a bondholder option to convert the bond into equity increases the value of the firm's option to call the bond, thereby reducing the value of the bond to bondholders.

Table 2, panel B, indicates that none of the insignificant differences in mean call value estimates relates to estimation orders in which call and conversion features are reversed in the estimation order. Thus, panel B confirms that mean call value estimates differ significantly for estimation orders in which the call feature is before the conversion feature vs. those in which the call feature is after the conversion feature. Because many of the insignificant differences in mean call value estimates relate to estimation orders in which the call feature is before vs. after put and sinking fund features, panel B indicates that, similar to conversion value estimates, the presence or absence of put and sinking fund features has little effect on call value estimates.¹³

Although put features have little effect on estimated values of conversion and call features, mean and median put value estimates in table 2, panel A, indicate that the converse does not hold. In particular, when the put feature is after the call and conversion features in the estimation order, its estimated mean values are less than when it is before the call and conversion features. However, table 2, panel B, indicates that there are significant mean differences only for estimation orders in which the put feature is before and after the conversion feature.

Table 2, panel A, also reveals that mean and median sinking fund values are small regardless of estimation order. These findings suggest that, for our sample bonds, the value of the firm's option to call a portion of the bond through the sinking fund provision is offset by the value associated with reduction of risk to bondholders. Nonetheless, panel B indicates that all mean sinking fund value estimates differ significantly across all estimation orders.

Taken together, the findings in table 2 indicate that for most estimation orders, bond component values estimated using an option pricing approach comprise a material portion

¹³ To isolate the interactive effects of conversion and call features on the other's estimated values, we calculated summary statistics relating to conversion and call values for three groups of bonds: convertible non-callable, callable non-convertible, and callable convertible bonds with no other features in addition to straight debt. Untabulated mean conversion/call values for estimation orders in which the feature is last are: 21.85/NA, NA/-1.89, and 15.29/-13.14. These statistics confirm that the call feature derives its value primarily from the existence of a conversion feature, i.e., -1.89 vs. -13.14. The presence of a call feature has a noticeable effect on the value of the conversion feature, although the value of the conversion feature is large regardless of whether there is a call feature, i.e., 21.85 vs. 15.29.

of bond par value, a necessary condition for relevance of a fundamental components approach to accounting for debt.

Financial Statement Effects of Fundamental Components Approach

This section addresses two empirical questions. First, does reclassifying bond components using a fundamental components approach materially affect financial statement amounts? Second, do financial statement amounts under a fundamental components approach differ materially depending on estimation order of bond components? We implement the fundamental components approach by classifying call features as assets, put features and straight debt as liabilities, and sinking fund features as assets or liabilities depending on whether estimated values are negative or positive. Table 3 presents comparative descriptive statistics for assets, liabilities, equity and the long-term debt-to-equity ratio, a common leverage measure.¹⁴

We implement the fundamental components approach for debt in two steps. First, we restate liabilities and equity to recognize bonds at their procedure-estimated total bond fair value, i.e., the value of a bond including all of its features. Second, we restate assets, liabilities and equity by reclassifying bond components using a fundamental components approach as described above. As an illustration of this two-step approach, consider a callable, convertible bond with a book value of 100 and total estimated value of 96, which comprises, under a particular estimation order, straight debt value of 106, conversion value of 5, and call value of -15. First, to recognize the bond at its fair value, liabilities are debited by 4, with an offsetting credit to equity. Second, to classify the call value as an asset and the conversion value as equity, assets are debited for 15, liabilities are credited for 10, and equity is credited for 5.

Table 3, panel A, summarizes the effects on liabilities, equity and the long-term debt-to-equity ratio of restating the bonds we value from book value (BV) to the procedure-estimated total bond fair value. We refer to the restated financial statements as being stated at fair value (FV), even though we only restate long-term debt and equity (i.e., assets are unaffected by this first step). Panel A indicates that for sample firms, on average, restating debt to fair value decreases liabilities and increases equity. It also indicates that the effect of fair value restatement on liabilities, equity and the long-term debt-to-equity ratio is significant, with mean changes of -8 and 24 percent for liabilities and equity, i.e., $[(FV-BV)/BV]$ times 100, and a mean decrease of 0.26 in the debt-to-equity ratio, i.e., $FV-BV$.¹⁵

Table 3, panel B, presents percentage difference (difference) statistics for assets, liabilities and equity (long-term debt-to-equity ratio) between amounts based on a fundamental components approach (FC) and based on recognizing bonds at the procedure-estimated total bond fair value (FV). Percentage differences are $[(FC-FV)/FV]$ times 100, and differences are $FC-FV$. Panel B presents these statistics for all component value estimation orders that result in changes in amounts for assets, liabilities, equity and the debt-to-equity ratio. Panel B indicates that reclassifying the values of conversion, call, put and sinking fund features has noticeable effects on liabilities, equity and long-term debt-to-equity ratios, relative to

¹⁴ Because book values for each bond are unavailable, for the analyses in table 3 and table 5 below, we assume book value equals par value.

¹⁵ Table 3 presents statistics relating to percentage differences for assets, liabilities and equity to facilitate comparison across firms. However, because the long-term debt-to-equity ratio is a scaled statistic and changes in it are comparable across firms, table 3 presents statistics relating to differences in the ratio rather than percentage differences. Tests for differences in medians indicate that almost all reported medians also differ statistically across estimation orders.

restating long-term debt to fair value. Untabulated statistics indicate that all mean percentage differences and differences reported in panel B are significantly different from zero.

Panel B of table 3 also indicates that the effect on equity of implementing a fundamental components approach for long-term debt is greatest for estimation orders in which the conversion feature is before the call feature. This order effect is consistent with the findings in table 2. Mean (median) increases in equity range from 10.21 to 10.86 (4.02 to 4.22) percent. The effect on equity is smallest for estimation orders in which the conversion feature is after the call, with mean (median) increases ranging from 5.86 to 6.34 (1.35 to 2.12) percent. The mean (median) decrease in the debt-to-equity ratio ranges from 0.09 to 0.12 (0.02 to 0.04) across all estimation orders. However, because the increase in equity is greatest when the conversion feature is before the call, for such estimation orders the decrease in the debt-to-equity ratio also is greatest.

Although there is a small but significant increase in assets for estimation orders in which the call feature is after the conversion feature, with mean (median) increases ranging from 1.83 to 1.98 (0.96 to 1.17) percent, there is little change in asset amounts for estimation orders in which the call feature is before the conversion feature. However, because call, conversion and many sinking fund values are not classified as liabilities regardless of their estimation order, liabilities vary little across estimation orders, with all means (medians) ranging from 3.96 to 4.60 (1.29 to 1.50) percent.

We highlight here the most notable differences in mean and median values of financial statement amounts in table 3, panel B. However, the last row in panel B indicates that many mean financial statement amounts differ significantly across estimation orders.¹⁶ For example, asset means differ significantly for 53 of 66 possible estimation order comparisons.

Table 3, panel C, summarizes the cumulative effects on liabilities, equity and the long-term debt-to-equity ratio associated with the two steps we use to restate financial statement amounts to those based on a fundamental components approach for debt. Because fair value debt restatement, step one, does not affect assets, the cumulative effect for assets equals that reported in panel B. Panel C indicates that all mean and median percentage differences and differences are large. Moreover, untabulated statistics indicate that all means are statistically different from zero. Panel C also indicates that mean (median) increases in equity range from 30.35 to 35.83 (12.96 to 19.20) percent, mean (median) decreases in liabilities range from 12.06 to 12.54 (8.60 to 9.12) percent, and mean (median) decreases in the debt-to-equity ratio range from 0.36 to 0.39 (0.15 to 0.18). Because differences across estimation orders arise solely from step two tabulated in panel B, panel C does not report tests of significance for differences in means across estimation orders.¹⁷

Taken together, the findings in table 3 indicate that the financial statement effects of implementing a fundamental components approach for compound debt instruments that we value are material. Key financial statement amounts and debt-to-equity ratios are significantly different under the fundamental components approach from those recognized and those based on restating financial statements only to reflect bonds at total bond fair value. Thus, financial statements based on a fundamental components approach for debt are potentially relevant. However, financial statement amounts differ significantly under alternative

¹⁶ Untabulated Wilcoxon signed-rank tests for differences in medians indicate that almost all reported medians also differ statistically across estimation orders.

¹⁷ Untabulated statistics relating to the 38 sample firms with only multiple-featured bonds result in similar inferences to those from table 3. However, for these firms, as expected, the effect of estimation order on financial statement amounts is more pronounced.

bond component estimation orders. Unless standard setters arbitrarily choose one estimation order for recognition of bond components, two otherwise equivalent firms that select different estimation orders can report substantially different financial statement amounts, affecting the relevance and reliability of their financial statements. However, because the choice is arbitrary, it is not necessarily the case that mandating a single estimation order will yield relevant and reliable financial statements.

VI. EVIDENCE ON RELIABILITY FROM COMPARISONS OF OPTION PRICING-BASED ESTIMATES TO AVAILABLE BENCHMARKS

This section provides evidence specifically relating to reliability of the bond value estimates. In contrast to many other financial instruments, corporate bonds have a long history in the capital markets, enabling comparison of some option pricing-based estimates to benchmarks obtained from established markets. Using bond market values as the first benchmark, we find that percentage differences between estimated total bond values and market values are insignificant. Although this finding suggests that estimated bond values are reliable, findings from two other comparisons suggest the opposite. Using total bond and component values estimated from the estimation procedure but with an alternative termination criterion as a second benchmark, we find value estimates that are significantly different from those reported in section V. Finally, using three market-based estimates of equity volatility as a third benchmark, we find that equity volatility derived from the estimation procedure is significantly larger than the market-based estimates.¹⁸

Comparison of Estimated Total Bond and Market Values

Although bond market values are an obvious benchmark to compare with our estimates of total bond value to assess the estimates' reliability, market values are available for only approximately one-half of the sample bonds. Moreover, market values are available only for total bond value and not for component values.¹⁹ Table 4 presents comparisons of market and estimated total bond value for bonds with different combinations of features. Because, by construction, the estimation procedure results in total bond value estimates that equal market values for firms with one publicly traded bond, the table 4 statistics excludes firms that have fewer than two publicly traded bonds, resulting in a sample of 156 bonds.

Table 4 reveals that for all 156 bonds, mean (median) estimated total bond values exceed market values by only 1.23 (0.84) percent, where percentage difference is defined as [(estimated value - market value)/market value] times 100. The table also reveals none of the mean percentage differences is significantly different from zero (assuming a

¹⁸ It is important to note that our tests relating to the reliability of bond value estimates are joint tests of the option pricing-based estimation procedure's ability to estimate bond value and the quality of the data we use to implement it. Because firms have access to more complete information about their bonds than the publicly available data we use, estimates of bond value likely would be more reliable after incorporating such information. That is, corporate management facing the task of estimating values for their own firm's bonds could obtain more reliable estimates than those we estimate. However, even with more complete information, it is likely that component value estimates and financial statement amounts will vary significantly across estimation orders. Thus, to the extent that differences in estimates and financial statement amounts across estimation orders affect reliability, more complete information will not necessarily enhance the reliability of financial statements based on a fundamental components approach to account for debt.

¹⁹ As financial markets expand to include more instruments, especially bond derivatives, e.g., strips, the resulting availability of market prices will permit more direct tests of reliability of component value estimates.

TABLE 4
Percentage Differences Between Total Bond Estimated Value and Market Value

Feature Combinations	n	Percentage Difference ^a			Test of Mean Percentage Difference Equal to Zero
		Mean	Median	Std. Dev.	
All bonds	156	1.23	0.84	8.21	1.87
Straight debt only	25	2.33	3.21	7.06	1.65
Conversion only	1	5.29	5.29	NA	NA
Call only	45	1.13	0.35	8.54	0.89
Conversion and call only	13	1.20	2.81	6.48	0.67
Call and sinking fund only	48	0.91	0.56	9.01	0.70
Conversion, call and put only	4	7.80	3.76	10.71	1.46
Conversion, call and sinking fund only	17	-1.50	-1.50	7.83	-0.79

^a Percentage difference for each bond equals [(estimated value - market value)/market value] times 100. Estimates are based on an option pricing-based estimation procedure. The sample is 156 publicly traded bonds from 45 publicly traded Compustat firms in 1990 with at least two publicly traded bonds. Rows present statistics for bonds with particular feature combinations.

two-sided alternative).²⁰ These findings indicate that estimates of total bond value are reliable with no systematic bias for bonds with particular combinations of features.

Comparison of Bond Values Estimated Using Alternative Search Termination Criteria

Recall that the estimation procedure's search termination criterion is minimization of the sum of squared deviations between estimated and market values for the firm's equity and its publicly traded bonds. The insignificant differences between estimated total bond and market values in table 4 could be attributable, in part, to the estimation procedure's termination criterion. Thus, we compare the total bond and component value estimates reported in section V to estimates obtained using the same estimation procedure, but with a different termination criterion. If the estimates differ significantly using the two alternative termination criteria, then option pricing-based bond value estimates may not be reliable. We also examine whether inferences regarding the effects on financial statements of using a fundamental components approach are affected by using total bond and component value estimates based on the alternative termination criterion.

As noted in section III, the estimation procedure yields an estimate of equity value and an estimate of equity volatility. The alternative termination criterion we use, which is based on a binomial version of the Black and Scholes (1973) option pricing model, is that estimated equity value and estimated equity volatility equal predetermined amounts. For ease of exposition, we refer to total bond and component value estimates obtained using the minimization termination criterion, our primary termination criterion, as MINEST estimates, and those obtained using the alternative termination criterion as ALTEST estimates.

Table 5, panel A, presents percentage differences and absolute percentage differences in total bond and component values estimated based on estimation orders in which the feature is last, i.e., those associated with the FASB's with-and-without method, using the two alternative termination criteria, i.e., $[(\text{ALTEST} - \text{MINEST}) / \text{MINEST}]$ times 100 and $[|\text{ALTEST} - \text{MINEST}| / \text{MINEST}]$ times 100.²¹ Panel A reveals that the differences are large and statistically significant for total bond value and each component value. Mean (median) ALTEST total bond values are 19.46 (7.47) percent larger than MINEST total bond values.²² If the alternative termination criteria affect component value estimates similarly, then a naive prediction is that mean percentage differences in component value estimates are similar to that for total bond value. However, panel A reveals that this is not the case. Mean (median) differences in component value estimates range from 56.81 to 205.38 (18.46 to

²⁰ The percentage differences in table 4 potentially understate the degree to which market values and estimates of total bond value diverge because positive and negative differences are offsetting. Untabulated statistics indicate that estimated values for 93 of the 156 bonds exceed market values and, as a result, mean and median absolute percentage differences (5.44 and 3.49 percent) are larger than tabulated mean and median percentage differences.

²¹ Table 5 presents statistics relating to one estimation order for the sake of parsimony. Inferences based on alternative estimation orders are the same as those based on the tabulated order. Note also that the bond sample size in table 5 is less than that in table 1 because the alternative termination criterion fails to provide convergent solutions for two firms. The minimization termination criterion always provides convergent solutions.

²² To determine whether differences between MINEST and ALTEST total bond value estimates are attributable to differences in MINEST and ALTEST estimates for publicly traded bonds used in the minimization termination criterion, we separately estimated mean percentage differences for publicly traded and non-publicly traded bonds. Untabulated tests reveal that percentage differences between MINEST and ALTEST mean total bond value estimates are large for non-publicly traded as well as publicly traded bonds, although the difference is larger for publicly traded bonds.

TABLE 5
Estimated Total Bond and Component Values
Panel A: Percentage and Absolute Percentage Differences in MINEST and ALTEST Total Bond and Component Value Estimates

	Value Estimates as Percentage of Bond Par Value				
	<u>Total Bond</u>	<u>Conversion</u>	<u>Call</u>	<u>Put</u>	<u>Sinking Fund</u>
Mean differences					
Percentage	19.46	-56.81	205.38	-62.32	160.15
Absolute percentage	20.26	76.63	235.78	65.49	240.74
Median differences					
Percentage	7.47	-69.22	28.98	-74.96	-18.46
Absolute percentage	8.35	71.69	66.33	74.96	100.00
t-statistic for mean differences					
Percentage	10.74	-7.52	5.90	-6.55	2.69
Absolute percentage	11.32	13.38	6.96	8.01	4.27
Number of bonds	422	110	204	18	91

In panel A, estimates are based on estimation orders in which the feature is last, i.e., orders associated with the FASB's with-and-without method, for bonds of 118 firms. Percentage differences equal [(ALTEST - MINEST)/MINEST] times 100. Absolute percentage differences equal [(ALTEST - MINEST)/MINEST] times 100.

(Continued on next page)

TABLE 5 (Continued)

Panel B: Assets, Liabilities, Equity and the Long-Term Debt-to-Equity Ratio

	Assets		Liabilities		Equity		Debt-to-Equity Ratio	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Book value	1,467.66	424.86	737.48	251.86	730.17	203.82	0.88	0.61
Fair value	NA	NA	733.55	244.87	734.11	212.14	0.94	0.62
Change ^a							0.06	
Percentage change ^a	NA		-1.10		4.70			
t-statistic	NA		-1.34		1.60		0.80	
Change from fair value to fundamental components								
Range across estimation orders ^b	0.39 to 2.79	0.04 to 1.04	-1.35 to -1.72	-0.11 to -0.23	3.71 to 11.82	0.47 to 2.19	-0.11 to 0.18	0.00 to -0.02
Number significantly different from each other	53/66		57/91		22/28		105/153	
Change from book value to fundamental components								
Range across estimation orders ^b	0.39 to 2.79	0.04 to 1.04	-2.61 to -2.91	-0.84 to -0.93	7.45 to 13.83	1.87 to 5.70	-0.05 to -0.12	-0.02 to -0.05

^a Changes are FV-BV and percentage changes are [(FV-BV)/BV] times 100.^b For FC compared with FV, ranges relating to assets, liabilities and equity are based on [(FC-FV)/FV] times 100 and ranges relating to the debt-to-equity ratio are based on FC-FV. For FC compared with BV, ranges relating to assets, liabilities and equity are based on [(FC-BV)/BV] times 100 and ranges relating to the debt-to-equity ratio are based on FC-BV.

Note that book values of assets do not change when debt is restated to fair value.

Estimates are based on a common option pricing procedure, but with alternative termination criteria. The first is that the sum of squared deviations between market and estimated values of the firm's equity and its publicly traded bonds is minimized (MINEST). The alternative criterion is that estimated equity value and estimated equity volatility equal predetermined amounts (ALTEST). The sample bonds are publicly traded Computat firms in 1990.

In panel B, estimates are based on bonds recognized at the procedure-estimated total bond fair value, i.e., the value of a bond including all of its components, (FV), at book value (BV), and based on a fundamental components approach (FC). Ranges for the fundamental components approach are across alternative bond component value estimation orders. Sample of 121 firms that have bonds with more than one feature.

74.96) percent. As expected, mean and median absolute percentage differences are larger than mean and median percentage differences. These large and varying percentage differences in component value estimates suggest option pricing-based bond value estimates may lack reliability.²³

Table 5, panel B, presents statistics analogous to those in table 3, but using ALTEST rather than MINEST bond value estimates. That is, table 5, panel B, presents percentage difference (difference) statistics for assets, liabilities and equity (long-term debt-to-equity ratio) between fair value (FV) and book value (BV) amounts, between amounts based on a fundamental components approach (FC) and FV amounts, and between FC and BV amounts. Panel B reports ranges in means and medians across component estimation orders for the comparisons of FC with FV amounts and of FC with BV amounts. We report ranges across all estimation orders rather than statistics for each estimation order for the sake of parsimony. Note that because ALTEST total bond values are closer to book values than are MINEST values, restating bonds to fair value has a smaller and insignificant effect on liabilities, equity and the long-term debt-to-equity ratio. The mean differences for liabilities and equity are -1.10 and 4.70 percent. The mean debt-to-equity ratio increases by 0.06, which contrasts with a mean decrease of 0.26 based on MINEST estimates.

However, the findings also indicate that relative to restating bonds to fair value, re-classifying ALTEST estimated values of conversion, call, put and sinking fund features using the fundamental components approach has effects on assets and equity similar in magnitude to those based on MINEST component value estimates. For example, the mean increases in equity based on ALTEST estimates range from 3.71 to 11.82 percent whereas those based on MINEST reported in table 3, panel B, range from 5.86 to 10.86 percent. However, the decrease in liabilities is smaller based on ALTEST estimates, with mean decreases ranging from 1.35 to 1.72 percent vs. 3.96 to 4.60 percent based on MINEST estimates. The resulting mean decreases in the debt-to-equity ratio are larger based on ALTEST estimates, ranging from 0.11 to 0.18 vs. 0.09 to 0.12 based on MINEST estimates. Untabulated tests for mean differences indicate that all FC-FV means are significantly different from zero. The final row in table 5, panel B, indicates that all mean and median cumulative FC-BV percentage differences and differences are smaller than those based on MINEST estimates in table 3, panel C.

Taken together, the findings in tables 3 and 5 indicate that although the financial statement effects of implementing a fundamental components approach for bonds differ using the two sets of value estimates, i.e., MINEST and ALTEST estimates, the basic inferences do not. Both sets of findings suggest that financial statements based on a fundamental components approach to account for corporate debt are potentially relevant to financial statement users, although such financial statements may lack reliability because financial statement amounts vary significantly across estimation orders. In addition, the findings in table 5 heighten reliability concerns because total bond and component value estimates based on the two termination criteria for the same estimation procedure differ markedly.

²³ To provide evidence on which bonds or firms are most susceptible to reliability problems, for each bond and its components we estimated a regression of the absolute percentage difference between MINEST and ALTEST estimates on firm and bond characteristics that are proxies for dimensions of bond value not explicitly incorporated in the estimation procedure. The bond characteristics include maturity and number of bond features, and the firm characteristics include the number of bonds we value and a market-based estimate of equity volatility. Untabulated findings indicate that some explanatory variables are significantly related to absolute percentage differences in total bond and call feature value estimates, although none is significantly related to absolute percentage differences in conversion, put and sinking fund feature value estimates. These findings suggest that reliability problems may be concentrated in bonds with call features. As noted in section III, this is consistent with the estimation procedure not explicitly incorporating interest rate risk.

Alternative Estimates of Equity Volatility

Recall that the option pricing-based estimation procedure yields implied estimates of equity value and equity volatility. By using bond and equity market values in the termination criterion, the estimation procedure's implied equity volatility estimate can reflect investors' assessments of a firm's future equity volatility. Thus, comparing observed equity market value and proxies for investors' assessments of future equity volatility to estimates obtained from the estimation procedure provides additional evidence on the reliability of bond value estimates. Regarding equity market value, the untabulated mean percentage difference between equity value estimates and equity market values, based on December 31, 1990 share prices, is essentially zero; the largest percentage difference for our sample firms is less than four percent. This finding is indirect evidence that bond value estimates are reliable.

Regarding equity volatility, table 6, panel A, presents descriptive statistics comparing the estimation procedure's implied equity volatility estimate, annualized, to two market-based proxies for expected annual equity volatility: historical and one-year-ahead. Historical equity volatility is commonly employed in option pricing models as an estimate of expected equity volatility.²⁴ One-year-ahead equity volatility is an estimate of expected equity volatility based on realized equity volatility in the subsequent year. Estimates of historical and one-year-ahead annual equity volatility are calculated using CRSP weekly equity returns during 1990 and 1991, respectively.²⁵ Panel B extends the comparisons to equity volatility implied by prices of traded call options on each firm's common stock for the subset of sample firms with traded options. This traded option-implied equity volatility estimate also incorporates investors' assessments of future equity volatility.

Table 6, panel A, reveals that the estimation procedure's implied equity volatility estimate has a larger mean and standard deviation than either historical or one-year-ahead equity volatility.²⁶ Mean procedure-implied and one-year-ahead equity volatility differ markedly, yet mean one-year-ahead equity volatility differs little from mean historical equity volatility. Untabulated statistics reveal that mean procedure-implied equity volatility is significantly larger than mean historical and mean one-year-ahead volatility, but means for the latter two benchmarks are statistically indistinguishable.²⁷ These findings are indirect evidence that bond value estimates may lack reliability.²⁸

²⁴ Alford and Boatsman (1995) investigate the ability of several alternative measures of historical equity volatility to predict future equity volatility in the context of employee stock options which have exercise periods that typically are much shorter than the time to maturity for corporate debt. Although they find the measures differ in their ability to predict future equity volatility, errors in pricing employee stock options because of errors in predicting volatility rarely would have a material effect on net income.

²⁵ Each annualized CRSP-based equity volatility estimate equals $\sqrt{\sum_j (r_j - \bar{r})^2 / 51} \times \sqrt{52}$ where r_j , $j = 1, \dots, 52$, are the weekly returns and $\bar{r}$ is the mean of the r_j s. The annualized procedure-implied equity volatility estimate equals $\sigma_1 \times \sqrt{2}$ where σ_1 is the initial binomial period's implied estimate of equity volatility, reflecting that the estimate is a semiannual estimate.

²⁶ The statistics in table 6, panel A, are computed on the subset of 100 firms for which procedure-implied equity volatility can be calculated. Calculation of equity volatility requires positive equity value estimates in the first binomial period's up and down states. That equity volatility cannot be calculated for 17 percent of sample firms is additional evidence indicating that the option pricing-based estimates of bond value may not be reliable.

²⁷ Nonetheless, untabulated findings also indicate that the three volatility measures are significantly positively correlated. Pearson (Spearman) correlations between procedure-implied volatility and historical and one-year-ahead volatility are 0.36 (0.45) and 0.26 (0.33); the historical and one-year-ahead correlations are 0.56 (0.62).

²⁸ Finding that mean procedure-implied equity volatility is more than double the mean for historical and one-year-ahead volatility is consistent with bond values estimated using the alternative termination criterion, ALTEST, being larger than bond values estimated using the minimization termination criterion, MINEST. Because, on average, bond market values are lower than ALTEST values, to obtain bond value estimates that are lower, and thus closer to market value, there needs to be more binomial states in which bond default occurs. The estimation procedure mechanistically achieves this by increasing implied equity volatility when the estimates are based on the minimization termination criterion. Stated another way, the finding that procedure-implied MINEST equity volatility is "too high" is a manifestation of the ALTEST bond value estimates being "too high" relative to bond market values.

TABLE 6
Annual Equity Volatility Implied by Option Pricing-Based Bond Value Estimation Procedure and Market-Based Estimates of Future Equity Volatility

Panel A: Historical Equity Volatility, Procedure-Implied Equity Volatility and Actual 1991 Equity Volatility				
	Historical	Procedure-Implied	Actual 1991	Historical and Procedure-Implied Percentage Difference
Mean	0.39	1.09	0.48	190.32
Std. dev.	0.15	0.60	0.23	133.68
Minimum	0.19	0.00	0.20	-99.02
Median	0.36	1.00	0.43	186.11
Maximum	1.17	3.95	1.46	717.93
				Historical and Actual 1991 Percentage Difference
				27.41
				47.16
				-42.83
				20.38
				255.77

In panel A, sample is 100 publicly traded Compustat firms in 1990 for which procedure-implied equity volatility is available.

Panel B: Historical Equity Volatility, Procedure-Implied Equity Volatility and Volatility Implied from Traded Options Prices

	Procedure-Implied	Historical	Traded Option-Implied	Procedure-Implied - Traded Option-Implied Percentage Difference	Historical - Traded Option-Implied Percentage Difference	Procedure-Implied - Historical Percentage Difference
Mean	0.94	0.34	0.38	178.15	-2.02	182.22
Std. dev.	0.35	0.10	0.15	126.98	33.47	76.72
Minimum	0.33	0.19	0.19	-20.48	-62.84	1.39
Median	0.86	0.32	0.34	161.09	-1.05	176.74
Maximum	2.06	0.58	0.77	548.56	79.65	344.61

In panel B, the sample is 23 publicly traded Compustat firms in 1990 which have publicly traded options. Volatility based on traded option prices is calculated using the Black and Scholes (1973) option-pricing model.

Annual market-based equity volatility estimates equal $\sqrt{\sum_{j=1}^52 (r_j - \bar{r})^2 / 51} \times \sqrt{52}$, where $r_j, j = 1, \dots, 52$ are CRSP weekly returns and $\bar{r}$ is the mean of the r_j s. Historical (actual 1991) equity volatility is based on 1990 (1991) weekly returns.

Annualized procedure-implied equity volatility equals $\sigma_1 \times \sqrt{2}$, where σ_1 is the initial binomial period's implied equity volatility estimate, reflecting that the procedure's estimate is semiannual.

Percentage difference is: [(procedure-implied or actual 1991 equity volatility-historical equity volatility)/historical equity volatility] times 100.

Table 6, panel B, presents descriptive statistics for equity volatility measures for the 23 firms with traded call options on their common stock. For firms with multiple traded options, traded call option-implied equity volatility is that which minimizes the sum of squared deviations between the market values and Black-Scholes-estimated values of the traded options (Manaster and Rendleman 1982). Because one-year-ahead and historical equity volatility are similar, table 6, panel B, omits statistics relating to one-year-ahead equity volatility. Panel B indicates that equity volatility implied by traded option prices differs little from historical equity volatility: the mean difference is two percent. Consistent with evidence in panel A for the larger sample, mean procedure-implied equity volatility is much higher than that for either traded option-implied or historical equity volatility. Mean procedure-implied volatility is significantly larger than mean traded option-implied volatility and mean historical volatility, but means for traded option-implied and historical equity volatility are statistically indistinguishable.²⁹ These findings corroborate those in panel A in providing indirect evidence that bond value estimates may not be reliable.

The table 6 evidence of lack of reliability of bond value estimates could be attributable to not explicitly incorporating interest rate risk in the estimation procedure. To investigate this possibility, we estimate, but do not tabulate, findings from several regressions explaining the difference between historical and procedure-implied equity volatility as a function of alternative proxies for interest rate risk. The proxies are bond beta estimated from a time-series regression of bond returns on the return of the 20-year Treasury bond zero coupon strip, and several variables based on bond maturity. Untabulated findings reveal that none of the proxies explains a significant portion of the variance in the difference between historical and procedure-implied equity volatility. These findings indicate either that none of the proxies adequately captures interest rate risk or the difference is not attributable to not explicitly incorporating interest rate risk in the estimation procedure.³⁰

VII. SUMMARY AND CONCLUDING REMARKS

This study uses an option pricing approach to estimate values of bonds and their features, specifically those relating to conversion, call, put and sinking fund provisions, for the purpose of implementing a fundamental components approach to account for corporate debt. Our objective is to assess relevance and reliability of option pricing-based bond value estimates. We find that estimated bond component values represent a significant portion of bond par value and that implementing a fundamental components approach for recognizing debt results in financial statement amounts and debt-to-equity ratios that are significantly different from those recognized under current GAAP. These findings are evidence that financial statements based on a fundamental components approach for debt are potentially relevant. That is, if the FASB requires a fundamental components approach to account for corporate debt, contracts based on financial statement amounts and/or the information conveyed to shareholders by financial statements could be materially affected.

We also find that conversion, call, put and sinking fund component value estimates are empirically sensitive to estimation order, resulting in financial statement amounts and debt-to-equity ratios that differ significantly across estimation orders. These findings have at least three implications for accounting for corporate debt based on a fundamental components approach. (1) Unless a GAAP standard specifies one estimation order for recognition

²⁹ The untabulated Pearson (Spearman) correlation between traded option-implied and procedure-implied equity volatility is 0.30 (0.23), and that between traded option-implied and historical equity volatility is 0.54 (0.41).

³⁰ A more direct test of whether procedure-implied equity volatility reflects interest rate risk would be to compare procedure-implied equity volatility estimates at different dates to determine whether the estimates change with changes in interest rates. We leave this approach to future research because estimating bond values at even a second balance sheet date would require extensive data collection and analysis beyond the scope of this study.

of corporate debt components, two otherwise equivalent firms could select different estimation orders and report substantially different financial statement amounts, affecting the relevance and reliability of their financial statements. (2) However, because the specification of a particular estimation order is arbitrary, requiring all firms to use a single estimation order will not necessarily yield relevant and reliable financial statements. (3) Because the FASB's with-and-without method requires arbitrary allocation of joint feature value arising from the features' value-interdependence, for firms with multiple-featured bonds, financial statements based on the with-and-without method also can lack relevance and reliability.

To provide evidence specifically relating to reliability of bond value estimates, we conduct three analyses comparing our option pricing-based estimates to available benchmarks. First, for publicly traded bonds, we compare total bond value estimates to market values and find that their means are statistically indistinguishable. This finding suggests bond value estimates are reliable. Second, we compare estimates of total bond and component values to those obtained using a variation of the estimation procedure that does not use traded bond prices as an input and find significant differences. Because both sets of estimates are based on a common estimation procedure, this is indirect evidence that bond value estimates lack reliability. Third, we compare the equity volatility estimate derived from the estimation procedure to three market-based estimates of equity volatility. We find that historical, one-year-ahead, and traded call option-implied equity volatility estimates are similar, but are only half as large as the equity volatility estimate derived from the estimation procedure. This finding is additional evidence that the option pricing-based bond value estimates lack reliability.

This study's findings suggest that implementing a fundamental components approach to account for corporate debt is potentially relevant to financial statement users. Yet, findings also suggest the bond value estimates lack reliability. Financial statement amounts differ significantly depending on estimation order of bond components and some comparisons of option pricing-based estimates to available benchmarks reveal significant differences. However, despite the differences between two alternative sets of bond value estimates, the financial statement effects of implementing a fundamental components approach based on either set of estimates are material.

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Political Costs and Earnings Management of Oil Companies During the 1990 Persian Gulf Crisis

Jerry C. Y. Han

Hong Kong University of Science and Technology

Shiing-wu Wang

University of Southern California

ABSTRACT: This study investigates whether firms that expect increases in earnings resulting from sudden product price increases use accounting accruals to reduce earnings and, thus, political sensitivity. Specifically, oil firms' accruals are analyzed in a period of rapid gasoline price increases during the 1990 Persian Gulf crisis. Our results show that oil firms that expected to profit from the crisis used accruals to reduce their reported quarterly earnings during the Gulf crisis. In contrast to previous research, we find that the tendency to release good earnings news early, documented in prior research, is reversed for oil firms during the Gulf crisis. This finding suggests that the benefit of disclosing "good news" (i.e., earnings increases) early may have been outweighed by the political costs associated with timely releases of the information.

Key Words: *Political costs, Accounting accruals, Reporting timeliness, Oil and gas.*

Data Availability: *Data are available from public sources described in the study.*

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I. INTRODUCTION

Iraq's invasion of Kuwait, on August 2, 1990, led to a sudden surge in world oil prices and in gasoline prices at U.S. service stations. Accusations that oil firms were price gouging resulted in widespread public outcry and demands for appropriate government actions.¹ In response, government agencies and politicians considered various actions. For example, the Justice Department launched an antitrust investigation against major oil companies, and lawmakers considered imposing some form of profits tax on oil companies.² Some outcomes of these political processes could have imposed significant costs on oil companies and adversely impacted their future operations.

Watts and Zimmerman (1986) maintain that reported profits attract the public's and politicians' attention in periods of unusual increases in consumer product prices (e.g., gasoline prices). Specifically, Watts and Zimmerman (1986, 362) hypothesize that "consumer product firms with rapid product price increases are more politically susceptible than other firms and therefore more likely to change accounting procedures to reduce reported profits." Prior research has examined the effect of costs due to political activity (political costs) resulting from import restriction hearings (Jones 1991) and antitrust investigations (Cahan 1992), but the effect of political costs arising from rapid consumer product price increases is yet to be tested with empirical evidence. The sudden increase in gasoline prices in the wake of 1990 Gulf crisis made oil firms vulnerable to political actions, allowing for a test of Watts and Zimmerman's (1986) hypothesis.³

We examine two groups of firms likely to be impacted by the events in the 1990 Gulf crisis. These are firms in the Crude Petroleum and Natural Gas industry and the Petroleum Refining industry whose reported earnings are expected to be positively affected by the rise in oil prices. While both groups are expected to benefit from the rise in oil prices, they are expected to have differing degrees of political visibility. Petroleum refining firms, because they derive considerable revenue from the sale of consumer products, are hypothesized to receive more publicity during the 1990 Gulf crisis and to be more vulnerable to wealth transfers from political action than crude petroleum and natural gas firms. The disparity in political sensitivity is likely to lead to different degrees of earnings management in the 1990 Gulf crisis.

Our results indicate that petroleum refining firms used accruals to reduce reported earnings during the 1990 Gulf crisis. However, no unusual accruals were observed for crude oil and natural gas firms in the same period. Petroleum refining firms also reported more special write-offs (measured by frequency and magnitude) to decrease earnings in this period than in the prior period. Finally, we find that petroleum refining firms with greater earnings increases were more likely to delay their fourth quarter earnings releases for the 1990 fiscal year. This finding is inconsistent with the reporting behavior documented in prior research (e.g., Chambers and Penman 1984; Kross and Schroeder 1994), but is consistent with the political cost argument that firms with large earnings increases in a

¹ See the *Wall Street Journal* (1990a).

² See the *Wall Street Journal* (1990b, 1990c).

³ Rapid increases in consumer product prices may not always lead to high political sensitivity for consumer product firms. Oil firms in the 1990 Gulf crisis had high political sensitivity because the sudden increases in gasoline prices immediately after Iraq's invasion of Kuwait were considered to be unjustified. It is suggested that high crude oil prices after Iraq's invasion of Kuwait should not be immediately reflected in gasoline prices because gasoline sold then was from inventory purchased at much lower prices (see, *Time Magazine* 1990). However, gasoline prices increased not only simultaneously with crude oil prices, but also faster than crude oil prices immediately after the 1990 Gulf crisis. This led to the accusation of price gouging and high political sensitivity for oil firms. Additionally, there are no close substitutes for gasoline and the effects of high gasoline prices are much more extensive.

politically sensitive period have few incentives to release “good news” early. Such an early release would attract additional public attention.

The remainder of the paper is organized as follows. Section II provides an overview of the political cost hypothesis and political costs to oil firms (e.g., potential oil profit tax in the 1990 Persian Gulf crisis). Section III describes the sample and research design, including the estimation of discretionary accounting accruals. Section IV reports the results and section V concludes the study.

II. THE OIL INDUSTRY AND POLITICAL COST HYPOTHESIS

Oil companies in the U.S. are classified by the nature of their operations into two groups under Standard Industrial Classification (SIC) codes: 1311 (Crude Petroleum and Natural Gas) and 2911 (Petroleum Refining). Firms in the crude petroleum and natural gas industry are mostly independent oil and gas producers, with operations concentrating on exploration and extraction of oil and gas. While firms in the petroleum refining industry (e.g., Exxon and Mobil) produce oil and gas, a significant portion of their operations is related to the refining and marketing of petroleum products (e.g., operating service stations). Firms in the petroleum refining industry tend to be larger in size than firms in the crude petroleum and natural gas industry.

Political costs include all expected costs (wealth transfers) imposed on a firm from potential adverse political actions involving antitrust, regulation, government subsidies, taxes, tariffs, etc. (Watts and Zimmerman 1978). Political costs for oil firms in the 1990 Persian Gulf crisis included the possibility of the revival of federal or state controls on oil and gas prices and the renewal of the windfall profits tax or some form of excessive profits tax. The latter potential tax costs received the most attention in the financial press.⁴ In fact, several bills were introduced in Congress to tax “excess” oil company profits during the Persian Gulf crisis. For example, legislation introduced in the Senate would have imposed a tax rate of 40 percent on oil company profits that exceeded the average profit for the preceding five years, beginning in the 1990 tax year.⁵

During the 1990 Persian Gulf crisis, consumers and politicians complained about the sudden increase of gasoline prices at service stations. Petroleum refining firms (SIC 2911) operate most service stations and the complaints of high gasoline prices focused political attention on the industry. Historically, major oil firms’ reported profits have received widespread public attention and have been used as an “excuse” for political actions against oil firms. For example, the unusually high profits reported by oil firms in 1979 contributed to the institution of the 1980 oil windfall profits tax.⁶ Consequently, it was not surprising that

⁴ See the *Wall Street Journal* (1991), the *Washington Post* (1991) and the *New York Times* (1991).

⁵ The legislation was sponsored by Senators Howard Metzenbaum (D-Ohio) and Joseph Lieberman (D-Connecticut). Metzenbaum indicated that the bill was needed due to the “extremely troubling and offensive” profits racked up by oil firms in the last three months of 1990.

⁶ The 1980 crude oil windfall profits tax was a temporary excise tax on the production and sale of domestic crude oil produced after February 29, 1980. It was instituted in part to respond to the public outcry over excessive profits reported by oil firms in 1979 in an environment of drastic increases in oil prices. See, the *Wall Street Journal* 1979a, 1979b, 1979c.) Also, see U.S. House Ways and Means Committee Report (1979) on reasons for the *Crude Oil Windfall Profits Tax Act*, which notes:

“Decontrol of oil prices, whether as a result of President Carter’s phaseout of controls or immediate decontrol in 1981..., will significantly increase profits of oil producers and royalty owners....

The committee believes that there should be a tax on the windfall arising from decontrol of crude oil prices and from excessive increases in world oil prices.”

the earnings of the major petroleum refining companies were monitored closely by the public and received wide-spread coverage by the financial press during the 1990 Persian Gulf crisis. Crude oil and natural gas firms (SIC 1311) do not operate many service stations and were not subject to the same degree of political scrutiny as were petroleum refining firms. Thus, petroleum refining firms are expected to have greater incentives to engage in income-reducing accounting manipulation than are crude oil and natural gas firms.

III. SAMPLE AND RESEARCH METHODS

Sample Selection

The sample in this study consists of firms on the Standard and Poor's Compustat database having a primary SIC code of 1311 (the crude petroleum and natural gas industry) or 2911 (the petroleum refining industry) and a fiscal year ending December 31.⁷ To be included in the analysis, firms had to meet data availability requirements described later. The selection process resulted in a sample of 76 firms with 47 firms in the crude petroleum and natural gas industry and 29 firms in the petroleum refining industry.

Descriptive statistics for crude oil and natural gas firms and petroleum refining firms for 1990 are presented in table 1. There are substantial differences between the two industries. Crude oil and natural gas firms are much smaller than petroleum refining firms, in both sales and assets. For example, crude oil and natural gas firms have average annual sales of \$524.6 million, compared to an average of \$22.8 billion for petroleum refining firms. The average annual loss (\$11.8 million) for crude oil and natural gas firms results from a large loss (\$1.695 billion) reported by one firm.⁸ Even if this firm is removed, crude oil and natural gas firms are not as profitable as petroleum refining firms, both in absolute terms (average of \$24.8 million in net income for crude oil and natural gas firms vs. \$1.197 billion for petroleum refining firms) and return on total assets (0.026 for crude oil and natural gas firms vs. 0.048 for petroleum refining firms).

Accounting Accruals

Prior research on the choice of accounting procedures has examined changes in accounting accruals for various reasons (e.g., Healy 1985; DeAngelo 1986). Accounting accruals reflect the aggregate effects of all accounting procedures on reported earnings and, thus, examining changes in accruals can enhance the power of tests. Additionally, accrual changes are less likely to attract attention from politicians and the public. Even if accruals manipulation is suspected, the information required to undo the accrual changes may be limited or unavailable, making it difficult to adjust away their effect (Schipper 1989).

Total accruals, defined as net income (after extraordinary items and discontinued operations) minus operating cash flows, are examined in this study.⁹ Operating cash flows are defined as working capital from operations (funds from operations) minus the sum of changes in inventory, accounts receivable, and other current assets, plus the sum of changes

⁷ The calendar-year restriction is necessary to hold political sensitivity constant for each period to allow an analysis of timeliness in earnings releases discussed later in the paper. This restriction is important because the political atmosphere in September 1990 may be different from that in October 1990. The disparity in political sensitivity makes it difficult to compare the delay in earnings announcement between firms with fiscal quarter ending on September 30 and firms with fiscal quarter ending on October 31.

⁸ This firm is included in the following analyses. However, the exclusion of this firm has no effect on our results.

⁹ The definition of total accruals is the same as that used by Bowen et al. (1986), DeAngelo et al. (1994) and DeFond and Jiambalvo (1994) and also similar to that used by Healy (1985). We also examined working capital accruals (DeFond and Jiambalvo 1994), defined as the sum of changes in inventory, accounts receivable and other current assets, less the sum of changes in accounts payable, income tax payable and other current liabilities. Results for working capital accruals closely resemble those of total accruals.

TABLE 1
Descriptive Statistics for Crude Oil and Natural Gas Firms (SIC 1311) and
Petroleum Refining Firms (SIC 2911)

	<i>Median</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Minimum</i>	<i>Maximum</i>
Crude oil and natural gas firms (n = 47)					
Sales	78.2	524.6	1,699.2	7.4	11,509.0
Assets	260.6	1,258.9	2,922.8	35.0	18,619.0
Earnings	7.2	-11.8	261.6	-1,695.0	300.0
ROA	0.033	0.024	0.078	-0.158	0.184
Petroleum refining firms (n = 29)					
Sales	9,673.4	22,803.5	30,162.1	45.8	106,479.0
Assets	9,056.6	21,092.1	27,842.6	167.5	106,431.0
Earnings	401.1	1,197.4	1,673.9	-18.6	6,533.0
ROA	0.053	0.048	0.037	-0.111	0.130

Variables other than ROA are in \$ millions. Sales, assets and earnings are sales, total assets and net income (after discontinued operations and extraordinary items) for the 1990 fiscal year ending on December 31. ROA is return on assets, which is the ratio of net income to total assets as of the end of the year.

in accounts payable, income tax payable, and other current liabilities.¹⁰ Effective for fiscal years ending after July 15, 1988, *Statement of Financial Accounting Standards* (SFAS) No. 95 (FASB 1987) requires U.S. companies to adopt the *Statement of Cash Flows*. For firms adopting SFAS No. 95, working capital from operations is no longer separately reported and must be estimated by: the sum of income before extraordinary items, depreciation and amortization, extraordinary items and discontinued operations, deferred taxes, equity in net loss (earnings), sales of property, plant and equipment and sale of investment-loss (gain), and funds from operations-other.¹¹

Actions to forestall political intervention are more likely to be observed in periods of rising political pressure. High gasoline and crude oil prices occurred in the third and fourth quarters of 1990 and earnings reported in these quarters were subject to greater scrutiny by the public.¹² If oil firms reduced political pressure by decreasing reported earnings, it was most likely to take place in the third and fourth quarters of 1990. Because the increase in political attention is concentrated in the last half of 1990, quarterly statements are likely to provide a more refined basis for examining earnings management behavior during the Gulf crisis than are annual statements. Consequently, quarterly financial statement variables are used in all empirical tests.

We estimate discretionary accruals as the residuals, ϵ_{it} , from the following model, using data pooled across all quarters over 1984–1990 for sample firms:

$$\begin{aligned} \text{TTAC}_{it}/\text{AST}_{it} = & \beta_0 + \beta_1(\Delta\text{REV}_{it}/\text{AST}_{it}) + \beta_2(\text{PPE}_{it}/\text{AST}_{it}) + \beta_3D_1 \\ & + \dots + \beta_5D_3 + \beta_6Y_{84} + \dots + \beta_{11}Y_{89} + \epsilon_{it} \end{aligned} \quad (1)$$

where TTAC_{it} is total accruals for firm i in quarter t , ΔREV_{it} is the change in sales for firm i in quarter t ($\text{REV}_{it} - \text{REV}_{it-1}$),¹³ AST_{it} is total assets for firm i in quarter t , PPE_{it} is the net property, plant and equipment for firm i in quarter t , D_t is a quarter indicator variable with 1 for the quarter t ($t = 1, 2, 3$) of the calendar year and 0 otherwise, Y_t is a year indicator variable with 1 for the year t ($t = 1984, \dots, 1989$) and 0 otherwise, and ϵ_{it} is the error term for firm i in quarter t .

The model in equation (1) is similar to the time-series model used in previous studies (e.g., McNichols and Wilson 1988; Jones 1991; Cahan 1992). As in prior research, the change in sales and net property, plant and equipment are used to control for nondiscretionary components in total accruals. The coefficient for ΔREV_{it} is expected to be positive

¹⁰ Specifically, total accruals are computed from Compustat quarterly data and defined as net income (Item 69) minus operating cash flows. Operating cash flows are defined as working capital from operations (computed by Item 82), minus the change in accounts receivable (Item 37), minus the change in inventory (Item 38), minus the change in other current assets (Item 39), plus the change in accounts payable (Item 46), plus the change in taxes payable (Item 47), plus the change in other current liabilities (Item 48). Change in working capital accounts, e.g., accounts receivable, is the difference between the current amount and the amount in the prior quarter.

¹¹ For firms adopting SFAS No. 95, working capital from operations is computed from Compustat data items as the sum of income before extraordinary items (Item 76), depreciation and amortization (Item 77), extraordinary items and discontinued operations (Item 78), deferred taxes (Item 79), equity in net loss (earnings) (Item 80), sales of property, plant and equipment and sale of investment-loss (gain) (Item 102), and funds from operations-other (Item 81). Data items reported on a cumulative basis in Compustat were adjusted to reflect quarterly value.

¹² The public's attention to oil firms' earnings and the third and fourth quarter earnings of 1990 is evidenced by articles in both the business and popular press, e.g., the *Wall Street Journal* (1991), the *Washington Post* (1991) and the *New York Times* (1991).

¹³ We measure changes in sales by the first difference in sales because changes in working capital accounts (e.g., changes in accounts receivable, changes in inventory, etc.) by definition is the first difference in those working capital accounts.

because changes in working capital accounts (e.g., changes in accounts receivable, changes in inventory, etc.) are part of total accruals and are positively related to changes in sales. The expected sign for PPE_{it} is negative because high fixed assets are expected to lead to high depreciation and deferred taxes.¹⁴ The quarter and year indicator variables are used to account for any variation in accruals in different quarters and years.

To test the political cost hypothesis, two indicator variables are added to equation (1) to verify whether estimated unusual accruals are correlated with periods of high political pressure. The model is as follows:

$$TTAC_{it}/AST_{it} = \beta_0 + \beta_1(\Delta REV_{it}/AST_{it}) + \beta_2(PPE_{it}/AST_{it}) + \beta_3D_1 \\ + \dots + \beta_5D_3 + \beta_6Y_{84} + \dots + \beta_{11}Y_{89} + \beta_{12}T_3 + \beta_{13}T_4 + \varepsilon_{it} \quad (2)$$

where T_3 is an indicator variable with 1 for the third quarter of 1990 and 0 otherwise, T_4 is an indicator variable with 1 for the fourth quarter of 1990 and 0 otherwise. If oil firms manipulated accounting accruals in the 1990 Gulf crisis to lower reported earnings, the coefficients for T_3 and T_4 are expected to be negative.

IV. RESULTS

Earnings Management

Equation (1) is estimated first by the ordinary least squares method by industry group. The ordinary least squares estimates indicate that the overall model is statistically significant at the 0.003 level for each industry group. The use of time-series data, however, may give rise to serial correlation within residuals. Specifically, the use of quarterly data in the estimate of equation (1) is likely to make residuals of any quarter be correlated to residuals of corresponding quarters in the prior year, i.e., fourth-order autocorrelation (Maddala 1977). Autocorrelation in residuals may lead to inefficient parameter estimates and biased standard error estimates for ordinary least squares estimates (Kmenta 1971; Maddala 1977). To analyze residuals for autocorrelation, we estimate autocorrelation parameters which show significant first-order and fourth-order autocorrelations. For example, for petroleum refining firms the first-order autoregressive coefficient is 0.08 and the fourth-order autoregressive coefficient is 0.10 and are both statistically significant at the 0.05 level. To obtain efficient and unbiased parameter estimates, we use the maximum likelihood method (after transforming for autocorrelation in residuals) to estimate all equations.¹⁵

Estimates of equation (1) for each industry group are reported in table 2. The signs for coefficients on the change in revenues and net property, plant and equipment are in the predicted direction for both groups, and the coefficients are all statistically significant at the 0.05 level except for the coefficient on the change in revenues for petroleum refining firms which is statistically significant at the 0.10 level. This suggests that the variables used

¹⁴ Ayres et al. (1996) report that revisions in oil reserve estimates for oil firms may affect depreciation expenses. We use oil reserve information disclosed in the footnotes to financial statements to verify whether unusual changes in reserves were reported by oil firms in 1990. No unusual change in oil reserves was observed in 1990. The mean percentage of change in reserves in 1990 was 2.2 percent (t-statistic = 0.56, p-value = 0.60).

¹⁵ The maximum likelihood method is based on the assumption that different populations generate different samples, and that some populations would generate a given sample more often than the others. To find parameters of a population that can generate the observed sample more often, the method specifies the likelihood function for the sample observations and then finds parameter values that maximize the function. The maximum likelihood method in this study employs a Gauss-Marquardt algorithm to maximize the log likelihood function. The optimization is performed for both the regression and autoregression parameters.

to control accrual level in the annual accrual model in prior research also perform well in predicting the quarterly accruals.¹⁶ The coefficients on the quarter indicator variables for petroleum refining firms are all positive indicating that total accruals for the first three quarters of the year are all higher than those of the fourth quarter, but the difference in accruals is statistically significant at the 0.05 level for the second and third quarters only. To examine this issue further, we performed three pairwise tests comparing coefficients of the quarter indicator variables for petroleum refining firms, e.g., a test $\beta_3 - \beta_4 = 0$. These test results show that only the difference in accruals between the first quarter and the second quarter is statistically significant at the 0.10 level. The coefficients on the year indicator variables are not statistically significant at conventional levels. Furthermore, we compare accrual structure (the structure of equation (1)) between crude oil and natural gas firms and petroleum refining firms. Our results suggests that there is no difference between these two groups in the relation between accruals and changes in sales and property, plant and equipment (F-statistic = 1.06).

The analysis of discretionary accruals (the residuals for equation (1)) shows that the mean residual for the event period (the third and fourth quarters of 1990 combined) for petroleum refining firms is -0.010 , compared to 0.001 for crude oil and natural gas firms in the same period. Figure 1 presents a graph of quarterly mean residuals for the event quarters, two quarters before and one quarter after the event period for each industry group. The graph shows that earnings management can be clearly observed for petroleum refining firms in the fourth quarter of 1990. Specifically, mean residuals for petroleum refining firms are positive in the first (0.007) and second (0.008) quarters of 1990 and become negative in the third (-0.007) and fourth (-0.012) quarters of 1990. The negative mean residual reverses in the first quarter of 1991 (0.004). Although the mean residual for crude oil and natural gas firms is negative in the fourth quarter of 1990, the trend of earnings management is less obvious for this group.

To test the political cost hypothesis, equation (2) is estimated by industry group with results reported in table 3. The statistically insignificant coefficients for T_3 and T_4 for crude oil and natural gas firms show that no unusual accruals were observed for the third and fourth quarters of 1990 for this group. For petroleum refining firms, the coefficient for T_3 is negative and statistically significant at the 0.10 level; the coefficient for T_4 is also negative and statistically significant at the 0.05 level. These results indicate that significant negative accounting accruals are observed for petroleum refining firms in the third and fourth quarters of 1990. To ensure that the results of the unusual accounting accruals for the fourth quarter of 1990 are not common to other fourth quarters for petroleum refining firms, accounting accruals for the fourth quarter of 1988 and 1989 are analyzed. In general, no unusual accounting accruals are observed. For example, when T_4 is 1 for the fourth quarter of 1989 and 0 otherwise, the coefficient is -0.015 (t -statistic = -0.94) for petroleum refining firms. These sensitivity analyses show that unusual accruals are not commonly observed for the fourth quarter of other years. Consequently, we conclude that unusual accruals for the fourth quarter of 1990 are consistent with the hypothesis that petroleum

¹⁶ Simulation results in Dechow et al. (1995) and Kang and Sivaramakrishnan (1995) suggest that the annual accrual models in prior research, e.g., Jones (1991) and McNichols and Wilson (1988), may have low power in detecting earnings management. Dechow et al. (1995) also indicate that the annual accrual model may be sensitive to extreme financial performance. We minimize these potential problems by using crude petroleum and gas firms as a control group in our analysis. Further, since these potential problems are identified for the annual accrual model, it is unclear as to the effect of those factors on the quarterly accrual model in this paper.

TABLE 2
Estimates for Equation (1) Using Maximum Likelihood Estimate
(t-statistics in parentheses)

$$\text{Model: } TTAC_{it}/AST_{it} = \beta_0 + \beta_1(\Delta REV_{it}/AST_{it}) + \beta_2(PPE_{it}/AST_{it}) \\ + \beta_3D_1 + \dots + \beta_5D_3 + \beta_6Y_{84} + \dots + \beta_{11}Y_{89} + \varepsilon_{it}$$

	<i>Crude Oil and Natural Gas</i> (<i>n</i> = 47)	<i>Petroleum Refining</i> (<i>n</i> = 29)
Intercept	0.004 (0.24)	-0.010 (-0.90)
$\Delta REV_{it}/AST_{it}$	0.141 (3.02)*	0.075 (1.66)**
PPE_{it}/AST_{it}	-0.058 (-3.18)*	-0.035 (-2.23)*
D_1	0.004 (0.42)	0.007 (1.55)
D_2	0.010 (1.22)	0.014 (3.05)*
D_3	0.006 (0.62)	0.013 (2.51)*
Total R^2	0.04	0.06

* Statistically significant at the 0.05 level (two-tailed).

** Statistically significant at the 0.10 level (two-tailed).

$TTAC_{it}$ is total accruals for firm i in quarter t measured by net income (Compustat quarterly Item 69) minus operating cash flows. Operating cash flows are defined as working capital from operations (computed by Item 82), minus the change in accounts receivable (Item 37), minus the change in inventory (Item 38), minus the change in other current assets (Item 39), plus the change in accounts payable (Item 46), plus the change in taxes payable (Item 47), plus the change in other current liabilities (Item 48). ΔREV_{it} is the change in sales for firm i in quarter t (Item 2), $(REV_{it} - REV_{it-1})$. AST_{it} is total assets for firm i in quarter t (Item 44). PPE_{it} is the net property, plant and equipment for firm i in quarter t (Item 42). D_t is a quarter indicator variable with 1 for the quarter t ($t = 1, 2, 3$) of the calendar year and 0 otherwise, Y_t is a year indicator variable with 1 for the year t ($t = 1984, \dots, 1989$) and 0 otherwise. The coefficients for the year indicator variables are not reported in the table because they are not statistically significant.

refining firms were under great political pressure to reduce earnings during the 1990 Gulf crisis.¹⁷

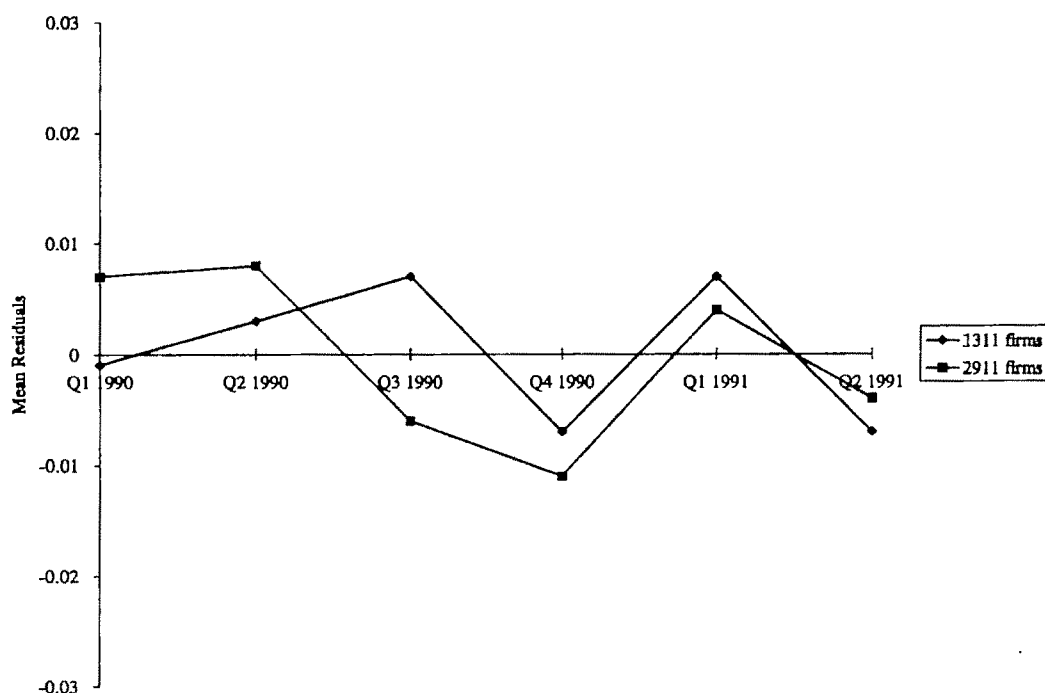
Analysis of Individual Items

Structural relations specified in equation (2) may be sensitive to rapid increases in input prices such as those that occurred for oil firms in the 1990 Gulf crisis.¹⁸ To provide further

¹⁷ We have also applied an approach similar to Jones (1991) by using data up to the fourth quarter of 1989 to estimate equation (1). Based on the estimates, we computed the expected accruals for the third and fourth quarters of 1990. Discretionary accruals then are defined as the difference between the actual accruals and the expected accruals. Results of this approach are similar to those reported by equation (2). In general, no unusual accruals are observed for SIC 1311 firms. However, mean discretionary accruals for SIC 2911 firms were -0.010 and -0.017 for the third and fourth quarters of 1990, respectively, both of which are statistically significant at the 0.10 level.

¹⁸ This can also be a potential problem for the modified model suggested by Dechow et al. (1995). We are grateful to the referees for the suggestions of analyzing individual accounts.

FIGURE 1
Mean Discretionary Accruals Around the Event Quarters for Crude Oil and Natural Gas Firms (SIC 1311) and Petroleum Refining Firms (SIC 2911)



evidence of earnings management for oil firms, two individual accounts of petroleum refining firms—inventory and special items—are analyzed. With rapid increases in input prices, LIFO firms can reduce reported profits by purchasing additional inventory (Frankel and Trezevant 1994). The effect of additional purchases is to create additional layers of ending inventory. Therefore, if LIFO firms use inventory to reduce reported profits in the periods investigated, the ending inventory value is expected to increase. Ending inventory value for the third and fourth quarters of 1990 for LIFO firms were compared with the corresponding quarters of 1989. The mean percentage increases in inventory in the third and fourth quarters in 1990 were 11.5 percent (t -statistic = 2.16) and 8.1 percent (t -statistic = 2.91), respectively; these increases are statistically different from 0 at the 0.05 level. Further, the mean percentage increase in inventory in the third (fourth) quarter of 1990 is statistically higher (at least at the 0.10 level) than that of all third (fourth) quarters from 1985 to 1989. This result is consistent with LIFO firms managing inventory levels to reduce reported profits in the third and fourth quarters of 1990.

It was reported in the financial press that oil firms wrote down the values of aging or unwanted oil fields and added reserves for cleaning up oil fields and refineries in the fourth quarter of 1990.¹⁹ These accounting events are generally categorized as special items. If oil firms used special items to reduce reported earnings, the frequency and the magnitude

¹⁹ See the *New York Times* (1991).

TABLE 3

Estimates of Changes in Total Accruals for the Third and Fourth Quarters of 1990 for
Equation (1) Using Maximum Likelihood Estimate
(t-statistics in parentheses)

$$\text{Model: } TTAC_{it}/AST_{it} = \beta_0 + \beta_1(\Delta REV_{it}/AST_{it}) + \beta_2(PPE_{it}/AST_{it}) \\ + \beta_3D_1 + \dots + \beta_5D_3 + \beta_6Y_{84} + \dots + \beta_{11}Y_{89} + \beta_{12}T_3 + \beta_{13}T_4 + \varepsilon_{it}$$

	Crude Oil and Natural Gas (n = 47)	Petroleum Refining (n = 29)
Intercept	0.001 (0.07)	-0.009 (-0.80)
$\Delta REV_{it}/AST_{it}$	0.137 (2.96)*	0.107 (2.29)*
PPE_{it}/AST_{it}	-0.054 (-3.62)*	-0.035 (-2.25)*
D ₁	0.004 (0.44)	0.005 (0.99)
D ₂	0.011 (1.14)	0.012 (2.39)*
D ₃	0.006 (0.63)	0.013 (2.45)*
T ₃	0.009 (0.49)	-0.023 (-1.92)**
T ₄	-0.009 (-0.47)	-0.024 (-2.00)*
Total R ²	0.06	0.07

* Statistically significant at the 0.05 level (two-tailed).

** Statistically significant at the 0.10 level (two-tailed).

T₃ is an indicator variable with 1 for the third quarter of 1990 and 0 otherwise, T₄ is an indicator variable with 1 for the fourth quarter of 1990 and 0 otherwise. All other variables are defined in table 2. The coefficients for the year indicator variables are not reported in the table because they are not statistically significant at conventional levels.

of negative special items should increase in the quarters investigated. Table 4 contains statistics for the frequency and magnitude of negative special items in the third and fourth quarters of 1989 and 1990. In general, there is no difference in the frequency of special items for the third quarter between 1989 and 1990 based on the Chi-square test. However, there was an increase in the number of firms reporting negative special items in the fourth quarter of 1990 (six firms) compared with the fourth quarter of 1989 (three firms). The Chi-square test shows that this increase in frequency is statistically significant at the 0.10 level. The mean special items (scaled by total assets) for the fourth quarter of 1990 is negative and roughly 0.54 percent of assets compared with 0.05 percent of assets in 1989. The difference in the means for the fourth quarter between 1989 and 1990 is statistically significant at the 0.05 level, suggesting that the magnitude of special items also increased in the fourth quarter of 1990. The analyses of inventory and special items in general provide

TABLE 4
Frequency and Magnitude of Special Items for Petroleum Refining Firms in the
Third and Fourth Quarters of 1989 and 1990

	<u>1989</u>	<u>1990</u>	<u>Total</u>
<i>Frequency of Special Items</i>			
<i>Third quarter (n = 24)</i>			
Special items < 0	1	1	2
Special items ≥ 0	23	14	37
Total	24	15	
Chi-square = 0.12, p-value = 0.73			
<i>Fourth quarter (n = 25)</i>			
Special items < 0	3	6	9
Special items ≥ 0	22	12	34
Total	25	18	
Chi-square = 2.88, p-value = 0.09			
<i>Magnitude of Special Items</i>			
<i>Third quarter (n = 24)</i>			
Mean	-0.0002	0.0014	
Std. Dev.	0.002	0.006	
Median	0.0	0.0	
<i>Fourth quarter (n = 25)</i>			
Mean	-0.0005	-0.0054	
Std. Dev.	0.004	0.010	
Median	0.0	0.0	
The magnitude of special items is scaled by total assets.			

additional evidence supporting accrual management by oil firms during the 1990 Gulf crisis.²⁰

Reporting Timeliness

Income-decreasing accruals may be implemented by managers for reasons other than reducing political sensitivity (e.g., Healy 1985; DeAngelo 1986; DeFond and Jambalvo 1994). It is unlikely, though, that incentives such as maximizing management compensation, minimizing purchase price in management buy-outs, or avoiding covenant violation would be industry-dependent and only significant in the fourth quarter of 1990. However, it could be argued that our results are simply consistent with the use of accounting accruals to "smooth" earnings in a period of drastic earnings increase. We believe that an investigation of earnings announcement timing can help distinguish the political cost explanation of our results from an income smoothing explanation.

²⁰ We also investigated whether oil firms adopted specific accounting methods, e.g., FASB's (1990) SFAS No. 106, *Employers' Accounting for Postretirement Benefits Other Than Pensions*, in 1990. Adoption of SFAS No. 106, which generally causes a significant drop in earnings, was not required until fiscal years starting after December 15, 1992. The investigation showed that only two firms adopted FASB's (1987) SFAS No. 96, *Accounting for Income Taxes*, and no firm adopted SFAS No. 106 in 1990. The effects of SFAS No. 96 for both firms were to increase reported income.

Prior research has shown that firms usually disclose "good news" (i.e., earnings increases) early and delay the release of "bad news" (e.g., Chambers and Penman 1984; Kross and Schroeder 1994). We assume that such timing patterns were detected in samples in which at least some firms were engaged in income smoothing. We also maintain that the oil firms during our test period would display the same timing patterns if income smoothing was the motivation for the observed income-decreasing accruals during the Gulf crisis. On the other hand, if reducing political sensitivity was the main concern for oil firms, the usual incentive of disclosing earnings increases early is likely to have been outweighed by the attention (and thus additional political costs) that the "good news" would attract from the public or politicians. Thus, the usual relationship between earnings changes and reporting timeliness in a politically sensitive period should be different from that observed in the other periods.

Table 5 reports the Spearman correlation coefficients between earnings changes and change in reporting timeliness for the four quarters of 1990 for the full sample and the two SIC code industries. For comparison purposes, we calculate the correlation coefficients for all non-sample firms with December fiscal year reported by Compustat. Earnings change (EC) is defined as $(e_q - e_{q-4})/|e_q|$, where e_q (e_{q-4}) is the reported earnings for quarter q ($q - 4$). Change in reporting timeliness (RT) is measured by $(d_q - d_{q-4})$, where d_q (d_{q-4}) is the number of days (from the fiscal quarter end to the earnings release date) it takes a firm to report earnings for quarter q ($q - 4$). Change in reporting timeliness shows that petroleum refining firms delayed the release of their 1990 fourth quarter earnings by an average of two days with the longest delay being two weeks. No obvious delay (the average change in reporting timeliness is minus one day) in the fourth quarter earnings releases is observed for crude oil and natural gas firms in the fourth quarter of 1990.

As shown in table 5, a negative correlation between EC and RT is found for non-sample December firms for every quarter in 1990, consistent with the finding of prior studies. Such a correlation, however, was reversed ($\rho = 0.404$) in the fourth quarter of 1990 for petroleum refining firms, the same industry and fiscal quarter in which significant income-decreasing accruals were observed. This positive correlation suggests that petroleum refining firms with greater earnings increases *delayed* the release of earnings. This finding is consistent with the hypothesis that earnings increases may induce greater political sensitivity, and firms have no incentives to release the "good news" in a timely fashion.

To ensure that this result is not due to the seasonality of SIC 2911 firms, we computed the correlation between EC and RT for the fourth quarters of 1989 and 1991. The Spearman correlations are -0.185 and 0.180 for those two quarters, respectively, and neither is statistically significant at conventional levels. In sum, our results suggest that petroleum refining firms used accounting accruals to reduce the reported earnings in the fourth quarter of 1990, and delayed the announcement of earnings growth to reduce political sensitivity.

In addition to the political concern of releasing "good" earnings early, a delay of earnings release may be the result of exploring special charges and income-reducing accounting accruals. In this case, we would expect greater income-reducing accruals for firms with longer delay in the quarterly earnings release. To verify, we replace T_4 in equation (2) with DRT_4 , where DRT_4 is equal to the number of days that the firm delayed its earnings release (change in reporting timeliness) for the fourth quarter in 1990 and 0 otherwise. The analysis shows that the coefficient DRT_4 is negative and statistically significant at the 0.09 level (t -statistic = -1.66). This result of greater income-reducing accruals for oil firms with late earnings releases suggests that the search of income-reducing accruals may have contributed to the delay in earnings release for the fourth quarter of 1990.

TABLE 5
Correlation Between Earnings Changes and Change in Reporting Timeliness

	<u>Q1-1990</u>	<u>Q2-1990</u>	<u>Q3-1990</u>	<u>Q4-1990</u>
<i>Compustat Nonsample December Firms</i>				
Sample size	1,126	1,162	1,172	1,138
Correlation coefficient	-0.147**	-0.199**	-0.191**	-0.157**
Significance level	0.00	0.00	0.00	0.00
<i>Crude Oil and Natural Gas Firms</i>				
Sample size	41	37	44	40
Correlation coefficient	-0.216	0.069	-0.211	-0.007
Significance level	0.17	0.69	0.17	0.97
<i>Petroleum Refining Firms</i>				
Sample size	30	30	30	31
Correlation coefficient	0.007	-0.189	-0.137	0.404*
Significance level	0.97	0.32	0.47	0.02

* Statistically significant at the 0.05 level (two-tailed).

** Statistically significant at the 0.01 level (two-tailed).

Spearman rank correlation coefficients are calculated between earnings changes (EC) and change in reporting timeliness (RT) for the four quarters in 1990. Earnings changes are defined as $(e_q - e_{q-4})/|e_q|$, where e_q (e_{q-4}) is the reported earnings for quarter q ($q - 4$). Change in reporting timeliness is defined as $(d_q - d_{q-4})$, where d_q (d_{q-4}) is the number of days between the earnings announcement date and fiscal quarter end for quarter q ($q - 4$).

V. CONCLUSIONS

A sudden increase in gasoline prices at service stations immediately after Iraq's invasion of Kuwait in August 1990 created public outcries, and threats of political actions against oil firms by politicians and the federal government followed. Because the public and politicians tend to pay attention to reported earnings in such cases, the political-cost hypothesis suggests that oil firms may have had incentives to decrease reported earnings to reduce the likelihood of potential adverse political actions.

We hypothesize that anticipated profit increases for oil firms in the 1990 Gulf crisis can be viewed as an indicator of political sensitivity. To test the political-cost hypothesis, unexpected accruals were analyzed for oil firms' fiscal year quarters after Iraq's invasion of Kuwait in 1990. The results indicated that petroleum refining firms used income-decreasing accruals in the third and fourth quarters of 1990 to reduce unusually large earnings increases. This behavior, however, was not evident for crude oil and natural gas firms. Analyses of individual accounts revealed that oil refining firms used inventory accounting and special items to reduce reported earnings in this period of political sensitivity.

In addition, we found a reversal of the usual relationship between earnings changes and reporting timeliness for petroleum refining firms in the fourth quarter of 1990. This finding suggests that the usual benefit of disclosing "good news" is outweighed by the political sensitivity associated with early releases. Overall, our results are consistent with the prediction of the political-cost hypothesis that consumer product firms encountering unusual increases of product prices (and thus greater political sensitivity) have incentives to decrease reported earnings to minimize their political sensitivity and related costs.

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Predisclosure Information and Institutional Ownership: A Cross-Sectional Examination of Market Revaluations During Earnings Announcement Periods

Samir M. El-Gazzar
Pace University

ABSTRACT: Institutional investors have strong incentives to search for private predisclosure information about companies in their portfolios because of their fiduciary responsibilities and large resource bases. In addition, large institutional ownership may induce a high level of voluntary disclosure prior to earnings announcements. Greater private information acquisition and greater levels of voluntary disclosures prior to earnings releases suggest that the content of the earnings releases by firms with higher institutional ownership is partially preempted in predisclosure market prices. This paper tests the hypothesis that the market price response to the earnings announcements is smaller for securities with higher institutional holdings. The empirical tests provide evidence that the higher the institutional holdings, the lower the market reaction to earnings releases after controlling for security capitalization and the number of analysts following the firm.

Key Words: *Earnings releases, Institutional investors' ownership, Predisclosure information, Size effect.*

Data Availability: *Data used in the tests are from public sources that are described in the text.*

I. INTRODUCTION

This paper examines the relationship between institutional investors' percentage ownership in a firm (IIPOF) and the market price reactions to that firm's earnings releases. Institutional investors develop private predisclosure information to satisfy

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their fiduciary responsibilities and to improve portfolio performance. Institutions have an incentive to develop private information because their actual or potential holdings of a security are so large. Therefore, the search for private information by institutional investors is cost-effective because the potential benefit is large. In addition, the managers of firms with a large institutional ownership may be induced to voluntarily release a high level of predisclosure information. If private information acquisition and voluntary disclosures prior to earnings reports preempt some of the content of earnings releases, then the market price reactions to earnings announcements will be smaller for firms with higher institutional holdings.

Prior research suggests that varying predisclosure information environments comprise one source of the cross-sectional differences in the market reactions to earnings announcements (e.g., Barry and Brown 1984; Atiase 1985; Dempsey 1989; Bhushan 1989). Most prior studies have focused on firm characteristics as indicators of predisclosure information.¹ Little research has examined the effect of investors' attributes on availability of predisclosure information. This paper focuses on institutional investors. Institutional investors are major holders of equity securities, and their influence on capital markets and corporate management is pervasive.²

This study analyzes unexpected market returns accompanying earnings announcements in relation to institutional ownership for a sample of 1,262 firm-quarters covering fiscal years 1987 to 1990. In addition to a univariate analysis, the paper reports results of multiple regression tests that examine the incremental effect of institutional ownership after controlling for security capitalization and the number of analysts following the firm.

The regression results support the hypothesis that higher institutional ownership is associated with smaller market price reaction to earnings announcements after controlling for analyst following and security capitalization. This finding suggests that a firm's ownership composition impacts the market reaction to accounting disclosures and provides further evidence that the process by which public disclosures of accounting information become impounded in market prices is complex. The evidence presented here suggests that understanding the impact of accounting disclosures on market prices requires viewing such disclosures as one element in the active, information-rich environment that determines security prices.

The remainder of this paper is organized as follows. Section II develops the hypothesis. Section III explains the research design. Section IV analyzes the empirical results. Section V provides the conclusions.

II. ANALYSIS AND HYPOTHESIS

Institutional investors have two incentives for developing private predisclosure information: (1) fiduciary responsibilities and (2) higher investment performance. With respect to fiduciary responsibilities, institutions are subject to federal and state regulations that require exercising due care. Thus, institutions can be sued by their clients (or beneficiaries)

¹ Examples of firm characteristics that proxy for predisclosure information include firm size (Atiase 1985), period of listing on stock exchange (Barry and Brown 1984), and number of news items (Grant 1980). It is important to note, however, that Atiase (1985) tests firm size as a proxy for investors' incentives to search for predisclosure information.

² The business community has expressed concern about the increasing power of institutional investors in the market and their influence over corporate policies. For instance, Nussbaum and Dobrzynski (1987) state that institutions hold blocks of securities and continually monitor corporate management. If they decide to sell their holdings in a specific firm, a sudden divestiture may leave the firm as a takeover target. Jones (1993) claims that institutional investors have contributed to the resignation of CEOs of major corporations such as GM, IBM and Kodak, because institutions believed that management did not serve owners' interests.

for negligence or poor investment performance (O'Brien and Bhushan 1990).³ To satisfy their fiduciary responsibilities, institutions develop a prudent/selective investment policy and continuously monitor their portfolios (Arbel et al. 1983). The efficient selection and monitoring of investments involves large-scale development of private predisclosure information (Brous and Kini 1994).⁴

Most institutional investors reward portfolio managers on quarterly performance (Hassel and Norman 1992). This compensation policy became the norm after the SEC (1985) relaxed its mandate which, for a long time, had precluded pension funds from using a performance-based fee structure to compensate investment managers. This compensation policy gives portfolio managers incentives to search for private information to help them improve investment performance.

In 1992, institutions held 50.6 percent of the equity securities of all US public corporations (SIA 1992). A concentration of institutional ownership within a particular firm is likely to trigger more voluntary disclosures by managers of that firm. Institutions with a large ownership stake in a firm can impose their investment objectives on firms by introducing motions and proposals at annual meetings which counter management policies (Hassel and Norman 1992). As a result, management is likely to voluntarily disclose important information about future plans to shareholders to gain their confidence. Thus, a higher percentage of institutional ownership is likely to be associated with more voluntarily-disclosed information that preempts some of the content of earnings releases.

The analysis so far suggests that the market prices of firms with a large institutional ownership are likely to impound earnings announcements prior to the public release of the earnings number. Prices are assumed to be affected when institutional investors take positions based upon the results of their private information search or when managers voluntarily release information in periods prior to earnings release. Thus, the analysis leads to the following hypothesis:

H1: The market reaction to earnings releases is inversely related to the percentage of the firm's stocks held by institutional investors.

III. RESEARCH DESIGN

Sample and Data Sources

A random sample stratified by quarter was drawn from all quarterly earnings announcement dates on the Compustat tape between 1987–1990. In each quarter, 20 percent of the earnings announcement dates were selected, yielding 3,953 firm-quarters. This sample was then screened for the following criteria: (1) CRSP daily returns available for the estimation and test period for each firm-quarter as described below; (2) institutional holdings and the market value of common equity at the quarter-end available on the *Spectrum Disclosure* database; (3) the number of analysts following the firm available from I/B/E/S; (4) December 31 fiscal year-end; and (5) no confounding events in the test period, such as management earnings forecasts or dividend announcements, merger or acquisition news, or bankruptcies.

The December 31 fiscal year-end constraint facilitated data collection, especially for institutional holdings. Examination of the *Wall Street Journal Index* (WSJI) for confounding

³ Young and Lombard (1985) document cases where the courts require trustees of investment funds to prove "prudent care."

⁴ In an interview with investment managers from four different institutions, the managers emphasized that they spend much time and effort on information collection and in-house analysis to improve portfolio performance and to satisfy their fiduciary responsibility standards.

events during the test period for each firm-quarter eliminated the potential effect of such events on the results. As shown in table 1, the screening process yielded a final sample of 1,262 observations.

Market Revaluation Indices

This paper uses unexpected security return (U_{jt}) to calculate two market revaluation indices during earnings announcement periods. The first index (RI(1)) is based on squared unexpected returns (e.g., Atiase 1985; Patell 1976), while the second (RI(2)) is based on absolute unexpected returns (e.g., May 1971; Dempsey 1989). They are calculated as follows:

$$RI(1)_{jq} = \frac{1}{2} \sum_{t=-1}^{t=0} \frac{U_{jt}^2}{C_{jt} S_j^2} \times \frac{T-4}{T-2} \quad (1)$$

$$RI(2)_{jq} = \frac{1}{2} \sum_{t=-1}^{t=0} |U_{jt}| \bigg/ \frac{1}{D_{jq}} \sum_{t=1}^{t=d_j} |U_{jt}| \quad (2)$$

where:

$RI(1)_{jq}$ = the average market revaluation index of firm j in the two-day period (day -1 , 0) of the quarter q earnings announcement using squared unexpected returns,

$RI(2)_{jq}$ = the average market revaluation index of firm j in the two-day period (day -1 , 0) of the quarter q earnings announcement using absolute unexpected returns,

$U_{jt} = R_{jt} - (A_j + B_j R_{mt})$,

R_{jt} = the return on security j on day t ,

R_{mt} = the equally weighted CRSP market index on day t ,

A_j and B_j = the market model parameter estimates for firm j , representing the intercept and the market return coefficients estimated over the 250 trading days preceding the end of the quarter q ,

S_j^2 = the variance of the regression residuals of firm j in the estimation period,

C_{jt} = correction factor of the variance of firm j for predictions outside the estimation period and is calculated as follows:

$$C_{jt} = 1 + \frac{1}{T} + \frac{(R_{mt} - \bar{R}_m)^2}{\sum_{k=1}^{k=T} (R_{mk} - \bar{R}_m)^2}$$

T = the number of days in the estimation period (generally 250 days), and

D_{jq} = the number of days in the earnings predisclosure period for firm j and quarter q ; it is the number of days between the end of quarter and the date of the earnings announcement.

The period for estimating market model parameters consists of the 250 trading days that immediately precede the end of quarter q . The test period is the two-day period (-1 , 0) around the announcement date, with the Compustat announcement date being day zero.⁵ The predisclosure period begins with the end of quarter q and ends two days before the announcement of quarter q earnings.

⁵ Expanding the test period for longer windows (e.g., days -1 , 0 and $+1$) produced similar conclusions.

TABLE 1
Sample Selection and Elimination Process

	<i>No. of Observations (Firm-Quarters)</i>
Base Sample (16 quarters, Fiscal 1987–1990)	19,764
20% Random Sample Stratified by Quarter	<u>3,953</u>
Sample Elimination:	
1. firm-quarters with no or incomplete data on CRSP daily returns tape.	693
2. firm-quarters with no data on institutional holdings.	1,389
3. firm-quarters with no information about analysts following on I/B/E/S tape.	313
4. firm-quarters with non-December 31 fiscal year-end.	257
5. firm-quarters with confounding events (management earnings forecast, etc.) in the test period.	<u>39</u>
Final Sample Used in Tests	<u>1,262</u>

RI(1) is a measure of the new information conveyed by the earnings release relative to the information that was available during the estimation period. RI(2) is a measure of the new information conveyed by the earnings release in relation to the information in the predisclosure period. A revaluation index greater than 1.0 means that the earnings report conveyed more than average information during the reference period. The hypothesis predicts an inverse relationship between both RI(1) and RI(2) and IIPOF in the report period.⁶

Multiple Regression Model

To determine if the market reaction to earnings announcements of the firm is incrementally impacted by the percentage of its shares held by institutional investors, the following multiple regressions (with the revaluation indices as the dependent variables) were estimated:

$$RI(k)_{jq} = A_0 + A_1(IIPOF_{jq}) + A_2(LOGCAP_{jq}) + A_3(ANAF_{jq}) + e_{jq} \quad (3)$$

where:

$IIPOF_{jq}$ = the percentage of security j held by institutional investors at the end of quarter q ,

$LOGCAP_{jq}$ = the natural log of the market value of the common equity of firm j at the end of quarter q ,

$ANAF_{jq}$ = the number of analysts who have earnings forecasts outstanding on firm j at the end of quarter q , and

$RI(k)_{jq}$ = where $k = 1, 2$ as defined in the previous section.

The source of the data for determining IIPOF is the *Spectrum Disclosure* as contained in *Compact Disclosure* for the years 1987 to 1990. *Spectrum Disclosure* lists the percentage of the firm's shares held by institutional investors to total outstanding shares at the end of

⁶ A third index, Standardized Revaluation Index (Atiase 1985; Patell 1976), was also developed and tested, but provided similar conclusions to those of RI(1) and RI(2). Therefore, the results based on this metric are not discussed further.

each quarter. Institutions are defined to include insurance companies, mutual funds, pension funds, bank trust departments and independent trustees.

CAP is measured by the market value of the common equity at the quarter-end taken from the *Spectrum Disclosure* database. The preliminary analysis of variables showed that the distribution of CAP is highly skewed to the right, with the mean higher than the median. To mitigate the effect of extreme values, the natural logarithm of CAP (LOGCAP) was used in the regression analysis. ANAF is measured by the number of analysts who are included in the consensus mean earnings forecast during the end-of-quarter month on the I/B/E/S tape.⁷

IV. RESULTS

Descriptive Statistics

Table 2 presents descriptive statistics and correlations between variables. For the sake of presenting the descriptive data, the total sample was partitioned into five portfolios based on the percentage of a firm's outstanding shares that were held by institutions. The firms with the highest percentage of institutional ownership were assigned to portfolio one, the next highest percentage into portfolio two and so on.

Panel A of table 2 indicates that the mean (median) of the institutional holdings (IIPOF) for the whole sample is 41.1 (42.54) percent. Portfolio one (P1), which includes firms in the highest quintile of institutional holdings, has a mean (median) IIPOF of 67.7 (65.9) percent. Portfolio five (P5), which includes firms in the lowest quintile of institutional holdings, has a mean (median) of 13.09 (11.95) percent.

Panel A of table 2 also shows that the market revaluation indices have means in the total sample of 1.58 and 1.31 for RI(1) and RI(2), respectively. That these means exceed 1.0 indicates that these earnings announcements convey new information on average, and is consistent with prior research (e.g., May 1971; Atiase 1985). At the portfolio level, the means of RI(1) and RI(2) increase as institutional holdings decrease. Portfolios one and two, which have the highest institutional holdings, exhibit smaller average market revaluations. As institutional holdings decrease in portfolios four and five, the mean revaluation indices increase. Further, the results of the Jonckheere tests (in panel B) of the ordinal relation between portfolio IIPOF and the mean portfolio market revaluation indices support the hypothesis that as IIPOF increases, the magnitude of the price reaction to earnings releases declines.⁸

Panel C of table 2 reveals that the revaluation indices are negatively correlated with IIPOF at the individual observation level. The negative correlation is consistent with the hypothesis that higher IIPOF is associated with smaller absolute price reactions. The correlations also show that the market revaluations are negatively correlated with CAP, LOGCAP and ANAF, supporting prior research (e.g., Atiase 1985; Dempsey 1989). The Pearson correlations show that LOGCAP has higher correlations than CAP with RI(1), RI(2) and ANAF, suggesting that LOGCAP is a more refined measure of capitalization. Further, IIPOF is significantly positively correlated with CAP, LOGCAP and ANAF, consistent with Bhushan (1989).

⁷ Measuring both CAP and ANAF at the end of quarter facilitates data collection.

⁸ The Jonckheere test is a nonparametric (one-way layout, k-samples) test of a directional relation between one variable across multiple samples. For large samples, the Jonckheere J* statistic has an asymptotic N(0,1) distribution. See Hollander and Wolfe (1973).

Multiple Regression Results

Table 3 presents results on the effect of IIPOF on the market reaction to earnings release conditional on CAP and ANAF. Panel A presents results of regressing RI(1) and RI(2) on LOGCAP and ANAF, while panel B reports results of regressions using IIPOF, LOGCAP and ANAF. Panels C and D present results for two different two-day periods arbitrarily selected during the estimation period (panel C) and the predisclosure period (panel D). The

TABLE 2
Summary Statistics of Variables: Institutional Holdings (IIPOF), Firm Capitalization (CAP and LOGCAP), Analyst Following (ANAF), and Market Revaluation Indices (RI(1), RI(2)) for the Total Sample and the Portfolios

Panel A: Mean/Median/Std. Dev. of Variables Within Portfolios Formed on the Basis of the Percentage of Institutional Ownership

	Sample					
	ALL N = 1,262	P1 N = 252	P2 N = 252	P3 N = 252	P4 N = 253	P5 N = 253
Explanatory Variables						
IIPOF	41.10%	67.70%	53.76%	42.02%	28.95%	13.09%
	42.54%	65.90%	52.01%	43.19%	27.20%	11.95%
	19.57%	6.11%	3.17%	3.51%	3.69%	6.14%
CAP	1,732	2,269	2,749	1,889	902	849
	692	1,480	1,039	614	225	110
	3,653	2,602	4,539	3,824	1,800	4,344
LOGCAP	6.160	7.093	6.916	6.353	5.573	4.871
	6.198	7.299	6.946	6.419	5.418	4.700
	1.722	1.277	1.525	1.591	1.593	1.531
ANAF	12.48	18.67	15.67	13.47	8.87	5.78
	10.00	20.00	16.00	11.00	6.00	3.00
	9.96	9.20	9.79	9.79	7.98	7.25
Market Revaluation Indices						
RI(1)	1.58	1.19	1.21	1.54	1.93	2.05
	0.65	0.71	0.59	0.61	0.64	0.75
	3.68	1.25	1.80	2.75	3.91	6.29
RI(2)	1.31	1.08	1.13	1.35	1.61	1.69
	0.53	0.55	0.47	0.54	0.53	0.56
	2.63	1.35	1.42	2.45	3.81	3.12

Panel B: Jonckheere Test^a

(Test of directional effect of IIPOF on RI(1) and RI(2))

$H_0: P1 = P2 = P3 = P4 = P5$

$H_a: P1 < P2 < P3 < P4 < P5$

Index	Jonckheere's J	Prob. > J
RI(1)	2.69	0.0041
RI(2)	3.05	0.0011

(Continued on next page)

TABLE 2 (Continued)

Panel C: Correlation Coefficients^b/Level of Significance

(Pearson correlations are above diagonal, and Spearman Rank correlations are below diagonal.)

	<i>RI(1)</i>	<i>RI(2)</i>	<i>IIPOF</i>	<i>CAP</i>	<i>LOGCAP</i>	<i>ANAF</i>
<i>RI(1)</i>		0.608 0.000	-0.083 0.003	-0.041 0.079	-0.088 0.001	-0.050 0.074
<i>RI(2)</i>	0.833 0.000		-0.113 0.000	-0.019 0.494	-0.094 0.001	-0.069 0.014
<i>IIPOF</i>	-0.049 0.052	-0.075 0.039		0.160 0.000	0.478 0.000	0.459 0.000
<i>CAP</i>	-0.055 0.057	-0.060 0.033	0.494 0.000		0.646 0.000	0.615 0.000
<i>LOGCAP</i>	-0.055 0.057	-0.060 0.033	0.494 0.000	1.000 0.000		0.835 0.000
<i>ANAF</i>	-0.038 0.185	-0.036 0.196	0.504 0.000	0.855 0.000	0.855 0.000	

Definitions:

P_i = Portfolios i ($i = 1, 2, \dots, 5$); P_i contains the firms in the i th quartile when sample firms are ranked in descending order according to the percentage of the firm's stock held by institutions in respective quarters;

$RI(1)$ = the average market revaluation index over the two-day earnings announcement period using the squared unexpected returns;

$RI(2)$ = the average market revaluation index over the two-day earnings announcement period using the absolute unexpected returns;

$IIPOF$ = the percentage of firm equity held by institutional investors at end of quarter;

CAP = the market value of the common equity at the end of quarter;

$LOGCAP$ = the natural logarithm of the market value of common equity at end of quarter;

$ANAF$ = the number of analysts who have earnings forecasts outstanding for the firm during the end-of-quarter month as reported on IBES tape.

* The Jonckheere test is a nonparametric test for a one-way layout (k -samples) comparison. The procedure uses Mann-Whitney rankings to produce the J factor. However, for large sample approximation the procedure produces a J^* statistic that has an asymptotic $N(0,1)$ distribution. The approximate alpha-level test is: Reject H_0 if $J^* \geq z_{(\alpha)}$. For details, see Hollander and Wolfe (1973).

^b Correlation coefficients are calculated with individual observations (not portfolio level values).

results of these regressions over non-earnings announcement periods provide a yardstick for evaluating the regressions run over the announcement period (e.g., Collins et al. 1981).

Panel A of table 3 shows that $LOGCAP$ has the expected sign and is statistically significant, consistent with prior studies (e.g., Atiase 1985). The coefficients of $ANAF$ have a positive sign but are insignificant. These results are inconsistent with Dempsey (1989) who reports negative and significant coefficients for $ANAF$, but positive and insignificant coefficients for $LOGCAP$. Dempsey (1989) covers the period 1976–1982, while the current study covers 1987–1990. The current study uses data that is equally balanced across all quarters, while Dempsey (1989) uses annual data. Further, the current study uses a two-day accumulation period vs. a five-day period by Dempsey (1989). Any of these variations in research design could have contributed to the differences between the two studies regarding $ANAF$ and $LOGCAP$.

TABLE 3

Results of Regressing the Market Revaluation Indices Against Institutional Holdings (IIPOF), Firm Capitalization (LOGCAP), and Number of Analysts Following the Firm (ANAF) (t-values in parentheses)

$$RI(k) = A_0 + A_1(IIPOF) + A_2(LOGCAP) + A_3(ANAF) + e$$

Coefficient Expected Sign	A_0 ?	A_1 —	A_2 —	A_3 —	R^2
<i>Panel A: Firm Capitalization and Analyst Following</i>					
RI(1)	3.275 (6.47) ^a		-0.339 (-3.05) ^a	0.029 (1.57)	0.10
RI(2)	2.331 (6.49) ^a		-0.182 (-2.34) ^a	0.008 (0.61)	.009
<i>Panel B: Institutional Holdings, Firm Capitalization and Analyst Following</i>					
RI(1)	3.34 (6.70) ^a	-0.011 (-1.87) ^b	-0.293 (-2.64) ^a	0.034 (1.79) ^b	.013
RI(2)	2.52 (6.90) ^a	-0.125 (-2.88) ^a	-0.139 (-1.74) ^b	0.012 (0.96)	.016
<i>Panel C: Regressions of Market Revaluation Indices Calculated for a Window of Two Consecutive Days Arbitrarily Selected (days No. 66 and No. 67) in the Estimation Period:</i>					
RI(1)	0.435 (1.56)	-0.002 (-0.45)	0.061 (0.98)	0.001 (0.05)	.004
RI(2)	0.833 (5.99) ^a	0.002 (0.85)	0.023 (0.77)	0.001 (0.07)	.006
<i>Panel D: Regressions of Market Revaluation Indices Calculated for a Window of Two Consecutive Days Arbitrarily Selected (days No. 18 and No. 19) in the Predisclosure Period:</i>					
RI(1)	1.210 (4.32) ^a	0.003 (0.96)	-0.057 (-0.94)	-0.008 (0.83)	.005
RI(2)	1.146 (9.06) ^a	0.002 (0.85)	-0.017 (-0.65)	0.006 (0.13)	.006

All variables are as defined in table 2.

^{a,b} Significant at .01, and .05 or less, respectively, for a one-tailed test.

The results of panel B show that the coefficient of IIPOF is significantly negative, supporting the hypothesis that higher institutional holdings are associated with smaller price reactions to earnings announcements, even after controlling for firm size and analyst following. The results also show that including IIPOF as an additional proxy for predisclosure information in the analysis improved the explanatory power of the model, relative to prior

studies that used CAP and ANAF only (e.g., Dempsey 1989).⁹ To assess the sensitivity of these results to extreme values, regressions on ranks, where the original variables are replaced by their ranks (Cheng et al. 1992), were performed and the results (not reported here) produced similar conclusions.

The results of panels C and D (regressions outside the announcement period) reveal no significant relationship between the market revaluation indices (RI(1) and RI(2)) and the explanatory variables. Comparing the results of these regressions with those of the regressions during the announcement period (panels A and B) suggests that the significantly negative relationships between the market revaluation indices and the explanatory variables are characteristics of the earnings announcement period only. This evidence indicates that the results obtained in the announcement period reflect the underlying forces of the hypothesis tested in this study. That is, the search for private information by institutional investors and the high level of voluntary disclosures by firms with higher IIPOF preempt some of the information content of the earnings announcement and, therefore, the market reactions to earnings releases is inversely related to the percentage of the firms' stocks held by institutional investors.

The above results suggest that both institutional ownership and firm size capture attributes that proxy for pre-announcement information. This study finds that analyst following does not have incremental explanatory power for announcement period returns when firm size and the percentage of institutional ownership are included in the set of explanatory variables. Note, however, that the R^2 s of the regressions are still generally low despite the inclusion of LOGCAP, ANAF and IIPOF in the model. The low explanatory power of these models suggests that we are still far from a complete characterization of cross-sectional differences in market reactions to earnings announcements.

V. CONCLUSIONS

This study analyzes the effect of institutional investors' ownership in a firm on the market reactions to that firm's earnings announcements, after controlling for other proxies for predisclosure information. Because of their fiduciary responsibilities and their large resource bases, institutional investors have strong incentives to develop private predisclosure information. In addition, managers of firms with large percentage of shares held by institutions may maintain a high-level of voluntary disclosure about the firm's major activities. If both private information search and voluntary disclosures preempt some of the content of the earnings announcements, and if this information is impounded in the preannouncement prices, then the market reactions to earnings releases should be smaller for firms with higher institutional holdings.

The results of regressing unexpected security returns, surrounding earnings announcement dates, on institutional holdings generally support the above inference. In particular, the market reactions to earnings releases of firms whose shares are heavily controlled by institutional investors are less volatile during earnings announcement periods than the reactions of firms with less institutional ownership. These results persist even after including other proxies for predisclosure information in the regressions: security capitalization and analyst following.

The findings of this paper suggest that the process by which public accounting disclosures are impounded in market prices is complex. Assessing the impact of public accounting

⁹ As a robustness check, I included the absolute percentage of the sell-side analysts' forecast error (APSSAFE) for each firm-quarter in the model along with IIPOF, LOGCAP and ANAF. The IIPOF coefficient is still significantly negative.

disclosures on security prices requires viewing such disclosures as one element in the active, information-rich environment that determines security prices.

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Fraudulently Misstated Financial Statements and Insider Trading: An Empirical Analysis

Scott L. Summers

John T. Sweeney

University of Missouri-Columbia

ABSTRACT: This study investigates the relationship between insider trading and fraud. We find that in the presence of fraud, insiders reduce their holdings of company stock through high levels of selling activity as measured by either the number of transactions, the number of shares sold, or the dollar amount of shares sold. Moreover, we present evidence that a cascaded logit model, incorporating insider trading variables and firm-specific financial characteristics, differentiates companies with fraud from companies without fraud.

Key Words: *Insider trading, Fraud risk assessment, Cascaded logit, SAS No. 82.*

Data Availability: *The list of sample firms may be obtained from the first author. The remainder of the data are available from public sources.*

I. INTRODUCTION

STATEMENT on Auditing Standards (SAS) No. 82, *Consideration of Fraud in a Financial Statement Audit* (American Institute of Certified Public Accountants 1997), asserts that auditors are responsible for planning and performing the audit to obtain reasonable assurance that the client's financial statements are free of material misstatement caused by fraud. Failure to detect financial statement fraud during the course of an audit can result in both damage to the auditor's reputation and significant litigation costs (Palmrose 1987). In order to obtain reasonable assurance that the client's financial statements are free of material misstatement resulting from fraud, SAS No. 82 directs auditors to consider risk factors ("red flags") relating to fraudulent reporting. This risk assessment is intended to influence the choice of audit procedures.

Prior research on financial statement fraud has generally focused on identifying such "red flags" (Romney et al. 1980; Sorenson et al. 1983) and combining these indicators into models for assessing the potential for financial statement fraud (Bell et al. 1991; Loebbecke

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et al. 1989; Beasley 1996). This study focuses on the association between financial statement fraud and a specific risk factor not identified as a "red flag" in SAS No. 82 or in prior empirical research—insider trading. We hypothesize that during the period of the fraud's occurrence, insiders in companies with fraudulent financial statements will strategically reduce their net position in the entity's stock. Specifically, we expect insiders to reduce their position by buying less stock and selling more stock in the entity during the period of the fraud.

Trading triggered by non-public (inside) information is prohibited by the Securities and Exchange Act of 1934. However, managers who commit financial statement fraud are likely to use their knowledge about the fraud to protect or increase their wealth. Managers who fraudulently issue misstated financial reports are likely to trade based on their knowledge of the impact of the fraud on the financial statements and on current prices if they believe that the impact will eventually be revealed. These managers could engage in both the fraud and the illegal insider trade with the expectation that neither would be discovered. Their inside trade would be rationalized by personal liquidity needs and the future realization of the fraud's impact (but not the fraud) could be excused as a bad economic outcome.

Our results indicate that insiders in companies with fraudulent financial statements reduce their net position in the entity's stock through a high level of stock sales activity. We find significant differences in insider trading activity and in several control variables between a matched sample of fraud-discovered firms and no-fraud firms. These results are relevant to auditors attempting to assess the risk of fraud in clients' financial statements. Auditors' assessments of fraud are likely to be enhanced if those assessments incorporate insider trading during the year under audit as well as firm-specific financial characteristics.

The remainder of this article proceeds as follows. Hypotheses are developed and stated in section II. The criteria utilized for sample selection are described in section III. In section IV, we discuss our research methodology. Results of statistical tests are given in section V and section VI contains our conclusions.

II. HYPOTHESIS DEVELOPMENT

The "red flag" literature warns auditors of certain management attitudes or characteristics that are expected to be associated with financial statement fraud (Bell et al. 1991; Romney et al. 1980; AICPA 1997; Sorenson et al. 1983). Some of these factors include excessive interest by management in maintaining or increasing the company's stock price through aggressive accounting practices, a commitment by management to achieve unrealistic forecasts, a lack of support for the entity's values or ethics, and a known history of securities law violations. Bell et al. (1991) and Loebbecke and Willingham (1988) describe this subset of "red flags" as indicators of an attitude or "tone at the top" that fosters the commission of a fraud. To the extent that such an attitude abets illegal acts in general, it is reasonable to assume that this same attitude abets illegal insider trading.

Although the vast majority of corporate insiders adhere strictly to insider trading rules and have legitimate, and legal, rationale for trading in their company's stock, empirical evidence suggests that insiders sometimes appear to engage in informed trading (Larcker et al. 1983; Odaiyappa and Nainar 1992; Penman 1982).¹ Sorenson et al. (1983, 99) contend that those individuals who perpetrate a fraud may use insider trading as a tool to extract

¹ The definition of a corporate insider varies across SEC rules and sections. For example, in connection with tender offers, an insider is defined as any party with material non-public information (Section 14(e)-3). In this study, we use the criteria of Section 16(b), which designates an insider as an officer, director, or 10 percent beneficial owner.

personal gains from a fraud. As such, one would expect greater insider trading activity in the presence of fraud than if fraud were not present. An alternative argument is that insiders will engage in less trading activity to avoid SEC scrutiny. However, an individual who is willing to engage in fraud is expected to possess low personal ethics (Ponemon 1993, 2), low risk aversion, and/or to have a downwardly biased assessment of the probability of detection. The personal characteristics that lead to the commission of fraud are also likely to lead to violations of insider trading rules. Insiders can exploit their private knowledge of overpriced stock resulting from fraudulent financial information by either selling securities in anticipation of subsequent price declines and/or reducing their purchases of securities.

Given the vigilance the SEC maintains over insider trades, insiders are aware that increases in reported buying or selling activity may draw unwanted scrutiny.² Nevertheless, insiders must trade if they are to benefit from their information. We expect that in the presence of fraud, insiders will strategically reduce their net position in the entity's stock. Specifically, in the presence of fraud, insiders are expected to engage in high levels of sales and low levels of purchases of company stock. As a lack of purchasing activity does not require any reports to be filed with the SEC, insiders should not be inhibited in this action.

If the above arguments are correct, then incorporating insider trading activity into a formal assessment of fraud risk should enhance that assessment. The following hypotheses examine the relationship between insider trading and financial statement fraud in the context of an auditor's risk assessment.

H1: Auditors' risk assessment of financial statement fraud will be enhanced through the inclusion of insider trading activity in their model.

In their assessment of fraud risk, auditors should specifically evaluate in their model whether insiders are reducing their net position in the entity's stock, consistent with the following hypotheses:

H1a: In the presence of fraud, insiders will engage in a high level of sales activity in their entity's stock.

H1b: In the presence of fraud, insiders will engage in a low level of purchasing activity in their entity's stock.

III. SAMPLE SELECTION AND DESCRIPTION

The Wall Street Journal Index was reviewed for the period 1980 through 1987 to identify companies for which an illegal act was reported. For each instance of an illegal act, the article cited in the *Wall Street Journal* was examined to determine if the act was a fraudulent one or of another nature.³ This procedure resulted in the collection of information on 184 companies for which fraud had been detected.⁴ CUSIP numbers for 73 companies were unavailable and 41 companies with CUSIPs were not found on Compustat (mainframe or CD versions) for either the year prior to the occurrence of fraud or the year of occurrence.

² Section 16 of the Securities and Exchange Act requires insiders to report any stock transaction to the SEC.

³ An inherent limitation in the study of fraud is the inability to identify all companies in which fraudulent acts occur. Frauds caught by the auditor and corrected within the company are generally not revealed publicly. Frauds not detected by the auditor but discovered later are more likely to appear in the press and increase the auditor's litigation risk. Frauds never discovered are not available for study. This study compares firms with discovered frauds that are publically revealed to firms that do not have publicly revealed frauds.

⁴ Professional standards (AICPA 1997) and prior research (Loebbecke et al. 1989; Sorenson et al. 1983) have noted that inventories and receivables are important in assessing audit risk due to fraud. In order to investigate these variables, the banking and insurance industries were excluded from the sample.

TABLE 1
Summary of Filters for Fraud Sample

<i>Sample Selection Filters</i>	
Companies with fraud reported in the <i>Wall Street Journal</i>	184
Companies without a CUSIP	(73)
Companies not on Compustat during the years of interest	(41)
Companies in Compustat with incomplete information	(19)
Companies for which fraud was reported in the Final Sample	<u>51</u>

Complete information could not be found on Compustat or in other sources (*Standard and Poor's Stock Reports*, Standard and Poor's Corporation, (1973–1988) or *Moody's Industrial Manual*, Moody's Investors Service, (1973–1988) for 19 companies. Information from *Who Audits America: Corporations and Accountants* (Who Audits America, 1976–1988) was extracted to augment the auditor information retrieved from Compustat.

Fifty-one companies with complete information are included in the final sample of fraud-discovered companies. Table 1 displays information about the sample selection filters, and the resulting number of companies for this study. The average time between perpetration of the fraud and its discovery was 3.02 years.

The fraud-discovered companies were matched with a control sample for hypothesis testing. Since industry membership is reported to influence the likelihood of litigation (Stice 1991), and since the "red flag" literature suggests that industry membership is a factor that affects the likelihood of fraud, the fraud-discovered companies were matched with the control companies based on their SIC code.⁵ Differences in company size could also influence the analyses performed. Rather than matching several control companies to each fraud-discovered company to analyze the effect of size, we minimized the data collection task and controlled for size by matching a single control company to the fraud-discovered company.

The control sample was drawn from the pool of companies on the Compustat data files. As Beasley (1996, 451) notes, a control company would be misclassified if a fraud is subsequently determined to have occurred in the sample period. To guard against this misclassification potential, *The Wall Street Journal Index* was reviewed for a period of seven years subsequent to the year of the fraud occurrence.⁶ No instances of fraud were noted for the control companies in the no-fraud sample.

During the audit planning process, the most recent non-fraudulent financial data available to company auditors would have been the prior period financial statements. Therefore, matching for the control group was performed based on the financial statements from the year before the fraudulent act occurred (pre-fraud financial statements).

IV. RESEARCH METHOD AND DESCRIPTION OF VARIABLES

Cascaded logit analysis is used to examine whether insider trading activity is a useful incremental indicator of the incidence of fraud. This method allows groups of factors that represent a shared underlying construct to be consolidated into a single index representing

⁵ Of the 51 companies in the fraud-discovered sample, we were able to match 40 companies in the control sample by four-digit SIC code, eight companies by three-digit SIC code, and three companies by two-digit SIC code.

⁶ We chose a period of seven years for subsequent review of the no-fraud sample companies because it represented the average time (three years) for the fraud-discovered sample between the perpetration of the fraud and its disclosure plus two standard deviations (two years).

the influence of that construct. As multiple measures are available to insider trading activity, and as none of these measures are thought to independently capture the underlying construct of insider trading activity, the cascaded logit is the method of choice. Bell et al. (1991) employed the cascaded logit approach to statistically model the influence of groups of related factors on the assessment of fraud.

The goal of this research is to examine the usefulness of insider trading activity as a factor to be used by external auditors in assessing the likelihood of fraud occurrence as required under SAS No. 82. Our application of cascaded logit analysis involves the estimation of three separate logit models. The first logit model will classify firms into fraud and no-fraud categories based upon financial statement characteristics that have been documented as diagnostic in prior studies. The second logit model will classify firms into fraud and no-fraud categories based upon insider trading variables. These two logit models represent the first-tier models in cascaded logit analysis. Each of these first-tier models generates an index, ranging from zero to one, of the risk of fraud based on the variables included in the model. Weights for the two indices are estimated and combined in the final (second-tier) logit model. The ability to weight groups of factors to assess their incremental contribution based upon maximum likelihood estimates makes the cascaded logit analysis preferable to a single stage logit approach.⁷

The first tier of logit models is based upon groupings of factors that jointly represent a relevant characteristic. There are two such groups in this research: a financial statement characteristics group and an insider trading characteristics group. The variables included in each of these groups are described below.

Financial Statement Variables

Financial Condition

Poor financial condition (Bell et al. 1991; Loebbecke et al. 1989) may motivate unethical insiders to take actions intended to improve the appearance of the company's financial position, perhaps to reduce the threat of loss of employment, or to garner as many resources as possible before termination. In addition to motivating the commission of fraud, poor financial condition may indicate a weak control environment, a condition that allows the perpetration of a fraud (AICPA 1997). Loebbecke et al. (1989) found that 19 percent of the fraud companies in their sample were experiencing solvency problems.

The measurement of a company's financial condition is operationalized by using Altman Z scores (Altman and McGough 1974). Alternative measures of financial health have been proposed (e.g., Ohlson 1980; Blum 1974), but Hammer (1983) demonstrates that the various models in the literature do not differ significantly in their ability to predict business failure. Hence, Altman's Z is utilized in the model as a control variable for differences in financial condition between fraud and no-fraud firms. Altman's Z score is computed as:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + .6X_4 + 1.0X_5 \quad (1)$$

where:

$$X_1 = (\text{current assets} - \text{current liabilities})/\text{total assets},$$

⁷ A single-stage logit model with both financial and insider trading variables was also estimated for diagnostic purposes. The single-stage logit model produces higher concordance measures and R²s than the final-tier model of the cascaded logit method, but statistical significance of the final-tier model is greater than that of the single-stage model.

X_2 = retained earnings/total assets,

X_3 = earnings before interest and taxes/total assets,

X_4 = market value of equity/BV of total liabilities, and

X_5 = sales/total assets.

The calculation of Altman's Z is based on information from the year prior to the year of fraud occurrence.

Financial Performance

A primary orientation assumed to be guiding corporations is profitability. Gordon (1964) notes that the profitability orientation is tempered by the manager's own utility maximization. That utility is partially defined by job security, which is maximized by means of producing smooth or increasing earnings streams. Implied is the expectation that management will be able to maintain or improve past levels of profitability, regardless of what those levels were. This expectation, if not met by actual performance, provides a motivation for financial statement fraud. Loebbecke et al. (1989) found that profit relative to industry was inadequate for 35 percent of companies with fraud in their sample. Financial performance is measured using return on assets (ROA) and serves as a control variable for performance differences between fraud and no-fraud firms in the sample. ROA is calculated as net income before extraordinary items in the year prior to the occurrence of the fraud divided by total assets at the end of that year.

Growth

Rapid growth is expected to be associated with the incidence of fraud (Beasley 1996; Bell et al. 1991; Loebbecke et al. 1989; Loebbecke and Willingham 1988). The vast majority of managers in high-growth companies do not commit fraud. However, unethical managers may be induced to misstate financial statements when growth slows or reverses in order to maintain the appearance of consistent growth. Moreover, sustained growth occurs in combination with changes in company structure (Pugh et al. 1968) and such changes result in increased uncertainty in roles and responsibilities (Baucus and Near 1991). Such uncertainty may motivate the perpetration of a fraud. Loebbecke et al. (1989) found that 29 percent of frauds in their sample were in high-growth companies.

The arguments above suggest that rapid growth and sustained growth could influence the likelihood of fraud in different ways. Rapid growth is thought to lead to weaknesses in internal control, while sustained growth is accompanied by structural changes that create role and responsibility uncertainty. Control variables representing each type of influence are used. First, a continuous variable (GROWTH) is used as the proxy for sustained growth. Second, a dichotomous variable (CLASSG) is used to address the issues associated with rapid growth. The continuous variable, GROWTH, is computed as the simple average of the percentage growth in sales over a three-year window ending in the year before the fraud occurred. The classificatory variable is created by assigning the variable a value of 1 if the company's sales growth in the year before the fraud occurred is in the top quartile of growth relative to all companies in the same three-digit industry in the Compustat population and zero otherwise.

Receivables/Inventory

SAS No. 47, *Audit Risk and Materiality in Conducting and Audit* (AICPA 1984, AU312.29), states that any account that requires subjective judgment in determining its value increases audit risk. Accounts receivable and inventory are noted as two such accounts

due to the subjective judgment involved in estimating uncollectible accounts and obsolete inventory. Because subjective judgment is involved in determining the value of these accounts, management may use these accounts as tools for financial statement manipulation. Loebbecke et al. (1989) found that the inventory account and accounts receivable were involved in 22 percent and 14 percent, respectively, of frauds in their sample.

The change in the ratio of receivables (inventory) to sales is computed as the ratio of receivables (inventory) to sales in the year t less the ratio of receivables (inventory) to sales in $t - 1$, where t is the year prior to the fraud occurrence. Specifically, the variables RECEIV and INVENT are measured, respectively, as $R_t/S_t - R_{t-1}/S_{t-1}$ and $I_t/S_t - I_{t-1}/S_{t-1}$, where R is accounts receivable, I is Inventory and S is Sales.

Auditor Change

Although the vast majority of auditor changes are for legitimate reasons, the risk of audit failure and subsequent litigation is higher during an initial engagement than in subsequent years (Stice 1991; St. Pierre and Anderson 1984).⁸ Sorenson et al. (1983) suggest that a client may even change auditors in order to reduce the likelihood of detection of a financial statement fraud. Loebbecke et al. (1989) found that 36 percent of the frauds in their sample were perpetrated in the first two years of an auditor's tenure. The auditor change variable (CHANGE) is operationalized as a dichotomous variable representing a new client (1), or an established client (0). A client is considered new if the auditor has been with the client for two years or less.

Insider Trading Variables

Trading activity is gathered from magnetic tapes acquired from the Securities and Exchange Commission. The dollar amount, number of shares and number of transactions for purchasing (P_{Money} , P_{Shares} , P_{Trans}) and selling (S_{Money} , S_{Shares} , S_{Trans}) by insiders during the fiscal year of the fraud occurrence are reflected in six independent variables. In addition, the net amount (sales minus purchases) of dollars and shares traded (N_{Money} , N_{Shares}), as well as the total number of stock transactions (T_{Trans}), are analyzed.

Descriptive Statistics

Descriptive statistics for each variable are presented in table 2 for the fraud-discovered and no-fraud-discovered samples. The mean is considerably larger than the median for many of the insider trading variables. This is due to a number of companies having no transactions by insiders, combined with a few companies that have substantial insider transactions. To minimize the influence of extremely large observations, we truncated observations to three standard deviations from the mean. Variables affected by this truncation include P_{Money} , P_{Shares} , S_{Money} and S_{Shares} . Even with the truncation, the insider trading variables do not approximate a normal distribution. Thus, both parametric and non-parametric statistical tests were performed. The non-parametric Wilcoxon Rank Sum test provided higher levels of significance as compared to the t-test for those variables found to be significant. For consistency across financial statement and insider trading variables, only the t-test is reported. Where appropriate, t-tests are adjusted for unequal variances in the two samples. Fortunately, logistic model coefficient estimates are not sensitive to departures from normality in the independent variables (Hosmer and Lemeshow 1989).

⁸ Stice (1991) defines audit failure as a subsequent circumstance which calls into question the quality of the audit or that brings to light evidence of a substandard audit. Undetected fraud would be an example of such audit failure.

TABLE 2
Descriptive Statistics and Comparison of Means for Fraud and Control Samples

		Mean	Difference	Median	Std. Dev.
CHANGE	Fraud = F	0.078		0	0.272
	No Fraud = NF	0.059	.019	0	0.238
RECEIV	F	-0.001		-0.002	0.038
	NF	-0.004	.003	-0.004	0.027
INVENT	F	0.004		-0.003	0.037
	NF	-0.013	.017**	-0.009	0.029
Z	F	1.557		1.509	0.654
	NF	1.474	.083	1.382	0.656
GROWTH	F	0.197		0.150	0.183
	NF	0.164	.033*	0.142	0.127
CLASSG	F	0.275		0	0.451
	NF	0.255	.020	0	0.440
ROA	F	0.075		0.065	0.046
	NF	0.046	.029***	0.047	0.062
S _{Money}	F	3,050,120		215,547	7,377,563
	NF	940,040	2,110,080*	44,080	3,343,451
S _{Shares}	F	235,600		30,920	754,387
	NF	55,586	180,014*	4,750	132,088
S _{Trans}	F	25,039		16	27,379
	NF	15,020	10,019**	6	23,688
P _{Money}	F	584,454		71,250	1,211,743
	NF	334,006	250,448	3,360	1,318,987
P _{Shares}	F	97,999		17,174	195,836
	NF	73,726	24,273	2,900	222,962
P _{Trans}	F	22,137		12	32,127
	NF	17,196	4,941	4	29,478

TABLE 2 (Continued)

		Mean	Difference	Median	Std. Dev.
N _{Money}	F	-2,465,666		-31,994	7,154,117
	NF	-606,034	-1,859,632*	-2,693	3,407,114
N _{Shares}	F	-137,602		0	690,661
	NF	18,140	-155,742	0	257,570
T _{Trans}	F	47,176		41	51,691
	NF	32,216	14,960	12	49,664

Significance levels: *** < .01, ** < .05, * < .1.

Z = Altman Z score;

GROWTH = simple average of the percentage growth in sales over the three years prior to the occurrence of fraud;

CLASSG = 1 if sales growth in the year prior to the occurrence of fraud is in the top 25% of the companies in industry, 0 otherwise;

RECEIV = (receivables_t/sales_t) - (receivables_{t-1}/sales_{t-1}) where t is the year prior to the occurrence of the fraud;INVENT = (inventory_t/sales_t) - (inventory_{t-1}/sales_{t-1}) where t is the year prior to the occurrence of the fraud;

ROA = net income before extraordinary items for year prior to occurrence to fraud/total assets (end of year);

CHANGE = 1 if new auditor in the year prior to fraud occurrence or the prior year, 0 otherwise;

P_{Money}, P_{Shares}, P_{Trans} = dollars spent purchasing shares, number of shares purchased, number of purchase transactions in year of fraud occurrence, respectively;S_{Money}, S_{Shares}, S_{Trans} = dollars received through selling shares, number of shares sold, number of sales transactions in year of fraud occurrence, respectively.N_{Money}, N_{Shares}, T_{Trans} = net dollar flow (purchases minus sales) in trading activity, net flow of shares (purchases minus sales), total number of transactions (purchases plus sales).

Inventory levels (INVENT) for the fraud-discovered companies increased while the inventory levels of the control sample declined in the year before the fraud. This result is consistent with the findings of Albrecht and Romney (1986). The fraud-discovered companies have a mean ROA of 7.5 percent which is significantly higher than the control sample mean of 4.6 percent. The GROWTH variable suggests that the fraud-discovered companies experienced greater sustained growth than the control sample over the previous three years. However, while Bell et al. (1991) found rapid growth to be significantly related to the perpetration of fraud, the fraud-discovered companies in this sample were not in a period of rapid growth (CLASSG) any more than the control sample. Fraud-discovered companies did not have recent auditor changes (CHANGE) more often, were not in greater financial distress (Z), and did not have different rates of change in receivables (RECEIV) than their control sample counterparts. Prior research found fraud-discovered companies had a greater average level of financial distress than a no-fraud control sample (Bell et al. 1991), but no significant difference in the average of the change in receivables relative to sales (Albrecht and Romney 1986).

Tables 2 indicates that trading activity was higher for the fraud-discovered companies than for the companies in the matched sample for all three measures of sales activity (S_{Money} , S_{Trans} , S_{Share}), supporting H1a. Hypothesis 1b is not supported as purchasing activity is not significantly lower for the fraud-discovered sample (P_{Money} , P_{Trans} , P_{Share}) than for the control sample. It is interesting to note, however, that when purchasing activities are netted with sales activities, the net money (N_{Money}) invested by insiders in their entity's stock declined significantly for fraud-discovered companies as compared to the control sample. Insiders from the fraud-discovered companies engage in nearly 50 percent more trades per year than insiders of the matched companies in the year of the perpetration of a fraud.⁹

Table 3 presents the correlations among financial and insider trading variables for the fraud-discovered companies and control companies. Each measure of insider trading activity is based on the same set of events, so correlations among these variables are expected to be high. Few of the correlations among the insider trading variables are insignificant. It is notable that N_{Money} and P_{Money} are not significantly correlated, indicating that insider selling activities may overwhelm purchasing activities. Among the financial statement variables, GROWTH is negatively correlated with the Z score and positively correlated with rapid growth (CLASSG) and ROA. GROWTH is also positively correlated with INVENT and ROA. The correlation of GROWTH with INVENT may be indicative of inventory obsolescence. In addition to its association with GROWTH, ROA is also positively related to rapid growth (CLASSG), increasing proportions of inventory (INVENT), decreasing proportions of receivables (RECEIV), and more stock transactions by insiders (P_{Trans} , S_{Trans} , or T_{Trans}). Both ROA and INVENT are positively correlated with FRAUD, as are measures of insider sales transactions.

V. RESULTS

This section presents the results of the cascaded logit analysis. The first-tier models are represented as:

⁹ In the post-fraud occurrence period, fewer significant differences are found among the financial characteristics. Fraud-discovered companies still exhibit significantly higher growth and higher ROA. Insiders still engage in more buying and selling transactions. Fraud-discovered company insiders purchase fewer dollars of stock and fewer shares of stock than the insiders of the matched companies which is consistent with H1b. Stock sales activities of insiders of fraud companies continue to be above the level of the matched group.

TABLE 3
Correlation Matrix for the Combined Fraud and Control Samples

	FRAUD	Z	GROWTH	CLASSG	RECEIV	INVENT	ROA	CHANGE	P _{Money}	P _{Shares}	P _{Treas}	S _{Money}	S _{Shares}	S _{Treas}	N _{Money}	N _{Shares}	N _{Treas}
FRAUD	1.0																
Z	.06	1.0															
GROWTH	.11	-.20**	1.0														
CLASSG	.02	.02	.51***	1.0													
RECEIV	.04	-.07	-.13	-.23**	1.0												
INVENT	.25**	-.13	.33***	.02	.28*	1.0											
ROA	.26***	.01	.38***	.16*	-.20**	.19*	1.0										
CHANGE	.04	-.02	.13	.01	.00	.00	.05	1.0									
P _{Money}	.10	.00	.03	.01	.17	.01	.06	.16*	1.0								
P _{Shares}	.06	.01	.01	.10	.08	.00	.23**	.18*	.30***	1.0							
P _{Treas}	.08	.07	-.04	-.01	-.01	-.01	.21**	-.04	.49***	.29***	1.0						
S _{Money}	.18*	-.03	-.02	-.13	.00	.05	.13	-.02	.22**	.40***	.30***	1.0					
S _{Shares}	.17*	-.02	-.02	-.09	.01	.01	.07	-.03	.21**	.29***	.21**	.80***	1.0				
S _{Treas}	.19*	.07	.17*	.05	-.17*	.09	.32***	.05	-.37***	.25***	.61***	.52***	.22**	1.0			
N _{Money}	-.17*	.03	.03	.13	.05	-.05	-.12	.06	.00	-.35***	-.20**	-.97***	-.77***	-.45***	1.0		
N _{Shares}	-.15	.02	-.03	.13	.02	-.01	.01	.10	-.11	.09	-.10	-.68***	-.92***	-.13	.67***	1.0	
N _{Treas}	.15	.08	.06	.02	-.10	.04	.29***	-.05	.48***	.31***	.92***	.44***	.24***	.88***	-.35***	.30***	1.0

Significance Levels: *** < .01, ** < .05, * < .1.
Fraud = 1 if fraudulent company, 0 if no fraud has been discovered.
All other variables defined in table 2.

Financial Statement Factors:

$$\text{FRAUD} = \beta_0 + \beta_1 Z + \beta_2 \text{GROWTH} + \beta_3 \text{CLASSG} + \beta_4 \text{RECEIV} \\ + \beta_5 \text{INVENT} + \beta_6 \text{ROA} + \beta_7 \text{CHANGE} + \varepsilon \quad (2)$$

Insider Trading Factors:

$$\text{FRAUD} = \beta_0 + \beta_1 P_{\text{Money}} + \beta_2 P_{\text{Shares}} + \beta_3 P_{\text{Trans}} + \beta_4 S_{\text{Money}} \\ + \beta_5 S_{\text{Shares}} + \beta_6 S_{\text{Trans}} + \varepsilon \quad (3)$$

where:

FRAUD = 1 if fraud-discovered group, 0 otherwise. All other variables as defined in section IV.

The first-tier model results are shown in table 4. Panel A presents the financial statement characteristics model. Panel B presents the insider trading factors model. The goal of these models is to provide indices/scores for the second-tier logit analysis. It is interesting to note that factors which were significant in both the correlation analysis and the univariate analysis, were also significant in the multivariate analysis. The variables INVENT and ROA contribute significantly to the model.

The concordance measure, which is based on all possible combinations of fraud/no-fraud companies, indicates that the financial statement factors model correctly ranks fraud companies higher than control companies 68 percent of the time. Classification accuracy using the midpoint of the index (.5) as a cutoff is approximately 60 percent.

In panel B, the insider trading factors model includes all three measures of sales activity and all three measures of purchasing activity. By including all three measures of each insider trade, the maximum information about insider trading is included in the model. Several other model specifications were tested to determine if a more parsimonious model adequately captured insiders activities. Specifically, we examined three other models of insider trading activities in terms of transactions, shares or money. In each case, the model that combines all three measures produced higher concordance measures and R^2 s. While this is partially attributable to the increase in the number of variables, it is also due to the more fully capturing insider behavior. The model presented correctly ranks fraud companies higher than no-fraud companies 63 percent of the time with a classification accuracy of 58 percent. High correlations among variables in the model results in multicollinearity. In that the index is of primary interest, multicollinearity in the model is not of concern.

The second-level model is represented as:

$$\text{FRAUD} = \beta_0 + \beta_1 F_{\text{SCORE}} + \beta_2 T_{\text{SCORE}} + \varepsilon \quad (4)$$

where:

FRAUD = 1 if fraud-discovered group, 0 otherwise;

F_{Score} = score from the Financial Statement Factors model; and

T_{Score} = score from the Insider Trading Factors model.

Table 5 presents the second-tier logit results. The analysis indicates that the model performs well. Both the financial statement factors index and the insider trading factors

TABLE 4
Results of the First-Tier Logit Models

Panel A: Financial Statement Factors
(n = 102)

$$FRAUD = \beta_0 + \beta_1 Z + \beta_2 GROWTH + \beta_3 CLASSG + \beta_4 RECEIV \\ + \beta_5 INVENT + \beta_6 ROA + \beta_7 CHANGE + \varepsilon$$

<i>Variables</i>	<i>Parameter Estimate</i>	<i>Chi-Square</i>
Z	.2811	.6898
GROWTH	-.8604	.1827
CLASSG	.1422	.0603
RECEIV	2.2190	.0802
INVENT	16.2649	3.7566
ROA	10.7201	4.1901
CHANGE	.1757	.0360
Intercept	-.9164	1.7411
Model R ²	.34	
Model Chi-square	13.261	
Model significance	.066	
Concordant pairs	67.8%	
Classification accuracy using a .5 cutoff value	59.8%	

Panel B: Insider Trading Factors
(n = 102)

$$FRAUD = \beta_0 + \beta_1 P_{Money} + \beta_2 P_{Shares} + \beta_3 P_{Trans} + \beta_4 S_{Money} + \beta_5 S_{Shares} + \beta_6 S_{Trans} + \varepsilon$$

P _{Money}	.00000007	.1167
P _{Shares}	-.00000041	.1069
P _{Trans}	-.0061	.4146
S _{Money}	.00000004	.1256
S _{Shares}	-.00000159	.6647
S _{Trans}	.0173	1.670
Intercept	-.3238	1.4579
Model R ²	.25	
Model Chi-square	6.983	
Model significance	.322	
Concordant pairs	62.7%	
Classification accuracy using a .5 cutoff value	57.8%	

All variables are defined in tables 2 and 3.

index make significant contributions to the model. However, the significance of each factor must be interpreted with caution. When a predicted value is used as an independent variable, the standard errors used in the significance tests for parameter estimates may be biased downward producing spurious inferences (Gujarati 1988). The overall model is not affected

TABLE 5
Results of the Second-Tier Logit Model

$$FRAUD = \beta_0 + \beta_1 F_{SCORE} + \beta_2 T_{SCORE} + \varepsilon$$

<i>Variables</i>	<i>Parameters</i>		
	<i>Estimate</i>	<i>Chi-Square</i>	<i>PR > Chi-Square</i>
F_{Score}	4.1615	8.2727	.0040
T_{Score}	3.6542	3.7213	.0537
Intercept	-3.9077	11.3778	.0007
Model R^2	.39		
Model Chi-square	16.674		
Model significance	.0002		
Concordant pairs	72.2%		
Classification accuracy using a .5 cutoff value	66.7%		

F_{Score} = score from the Financial Statement Factors model.

T_{Score} = score from the Insider Trading Factors model.

by the bias and is highly significant. The weighting of each factor grouping is shown by the parameter estimates. The parameter estimates reveal that more weight is given to the financial statement factors than to the insider trading factors. The parameter estimate for the insider trading factors does show a large contribution to the overall risk assessment, supporting H1. These results also indicate that pre-fraud financial statement factors have explanatory power in assessing the likelihood of fraud prior to its occurrence. Model concordance increases from 68 percent in the first-tier model with just financial statement factors (table 4) to 72 percent in the second-tier model that includes both the financial statement factors and the insider trading factors indices. Importantly, classification accuracy increases from 60 percent in the financial statement characteristics model to 67 percent in the second-tier model.

VI. CONCLUSION

The purpose of this study was to analyze the relationship between financial statement fraud and insider trading activity to determine whether auditors could enhance financial statement fraud risk assessment by including insider trading activity in their model. Using a matched sample of fraud and no-fraud companies, we found differences in insider trading activity variables and important financial statement control variables between the two samples. As hypothesized (H1a), insiders in companies where fraud is found reduce their net position in the entity's stock by engaging in significant selling activity, regardless of whether selling activity is measured by dollars of shares sold, number of shares sold or number of selling transactions. The hypothesis (H1b) of a reduction in purchasing activity was not supported. Additionally, we find that fraud companies have significantly more inventory relative to sales, are growing faster, and have a higher return on assets than no-fraud companies in the year before the occurrence of the fraud.

The results of this study indicate that insider trading and financial statement factors are useful in a model which distinguishes companies where fraud is found from companies where fraud is not found. This is a significant contribution to both auditors attempting to detect fraud and to regulators monitoring insider trading.

There are a number of limitations to this study. First, this study examines the population of companies for which fraud was discovered after an audit. Hence, two types of fraud are

not included in the fraud sample: undiscovered fraud and fraud discovered during the audit. Second, this study may have a newsworthiness bias. The study over-sampled discovered fraud with respect to the newsworthiness of the fraud. Frauds not reported in the *Wall Street Journal* were not used in this research. The extent to which this model is biased toward identifying environments that are conducive to newsworthy fraud is unknown. Furthermore, the ethical implications of fraud and the perpetration of fraud are not addressed. Future research should incorporate the study of individual ethics in relation to the perpetration of a fraud (Ponemon 1993). Third, this study did not use a hold out sample to validate the models that are presented. Further research with larger samples will be necessary to validate these results.

Finally, this study is limited in that it does not address finer classifications of fraud. Turner (1980) proposes classification of management fraud into four classes, according to whether the distortion of the financial statements is the vehicle for the fraud or a disguise of the fraud, and according to who benefits from the fraud: the company or the perpetrator. Our model does not assess the likelihood of a particular class of fraud.

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BOOK REVIEWS

Thomas H. Williams, Editor

Editor's Note: Two copies of books for review should be sent to Professor Thomas H. Williams, McIntire School of Commerce, University of Virginia, Charlottesville, VA 22903-2493. The policy of *The Accounting Review* is to publish only those reviews solicited by the Book Review Editor. Unsolicited reviews will not be accepted.

MICHAEL POWER, ed., *Accounting and Science* (Cambridge: Cambridge University Press, 1996, pp. xvii, 288).

This twenty-sixth volume of the Cambridge Studies in Management series, *Accounting and Science*, collects the essays of ten international scholars who write about relationships between organizations, society and disciplines. The essays first appeared in 1994 as a special issue of *Science in Context*, a journal published by Cambridge University Press. By their very nature, interdisciplinary discourses focus more on factors that link the disciplines than on details of a single discipline. Thus, it should come as no surprise that the articles are less about accounting or science than they are about the impact of relationships, the connections between theories and events (a spider's web view of life), and the process of change. Bruno Latour's forward rails against the "flat-earthers" for whom there is "no third dimension...no society, no big animal" (xi). The essays that follow attempt to break through the distances that separate the disciplines.

The introduction, which is written by Michael Power, the editor of the volume, provides both an overview of the essays that follow and a context in which to view those essays. He attempts

to provide a schematic guide to an emergent field of inquiry: science and accounting. This guide sketches a prototype for a research agenda which unites the collection of essays...and must be articulated with two points firmly in mind: a nonessentialist view of what counts as accounting and a constructivist symmetry in the treatment of science and accounting. (3)

The view of accounting in the essays is broad, ranging from the quantitative to the economics of events. History and sociology serve as the roots of the book more than particular issues drawn from accounting or science.

Following the introduction, Theodore M. Porter discusses "Making Things Quantitative," focusing on the tension between the detachment that numbers can provide and the changes that those same numbers can effect. The essay details relationships: things quantified, the logic behind the quantification, the specifics lost in the process of summarizing, the ability to communicate through quantification, and the effects of the process. Porter concludes that there "is strength in numbers, and anyone who proposes to wield them more effectively must ask not only about their validity but also about how the world might be changed by adopting new forms of quantification" (53). This essay would provide a good basis for discussion in almost any graduate management class.

Myles W. Jackson's essay, "Natural and Artificial Budgets: Accounting for Goethe's Economy of Nature," provides anecdotal evidence of how the perception of economic value can influence developments in science and how scientific studies can affect changes in administrative activities. Goethe's professional life as a public administrator allowed him to implement a number of innovations that grew out of his personal interest in natural science. Budgets served as a link between his scientific and administrative endeavors, as he tried to copy the natural budgets he observed at work in nature into the policies he implemented in Weimar. The essay discusses Goethe's administrative duties in Weimar, his scientific studies and his involvement in mining.

Timothy L. Albarn takes the reader to the world of the British actuary during Victorian times in his essay, "A Calculating Profession: Victorian Actuaries Among the Statisticians." He traces the history of actuaries as they struggle to define their profession and to gain acceptance for it. Since the actuaries' skills require a balance between interpretation and precision, the history provides an interesting view of the changes and growth that went on in the profession as its members tried to determine the profession's aims and boundaries.

The next essay, "The Factory as Laboratory," by Peter Miller and Ted O'Leary provides a history as well, but of a very different kind: it discusses in detail the transformation of the Caterpillar Inc. facility based in Decatur, Illinois. The authors affirm that a laboratory is more than just a building where scientists work. It is something much broader and more encompassing. They conclude that if "studies of science and technology are to shed their latent epistemology, then they should address all those locales in which attempts are made to act upon and transform the world by means of diverse instruments, ideas, and calculations" (145).

Keith Robson's essay, "Connecting Science to the Economic: Accounting Calculation and the Visibility of Research and Development," investigates the linkage between science, technology and economic factors, and how accounting numbers have helped provide the means to join them. Accounting for research and development costs provides a perfect vehicle for examining the valuation of science: "accounting techniques came to be seen as one means of *connecting science* to the national economy by enhancing individual managers' *responsibility* for science and technology through economic calculation" (151).

The essay by Brad Sherman, "Governing Science: Patents and Public Sector Research," likewise focuses on accounting and science. It explores how the method of accounting has changed as universities and other public-sector entities in the United Kingdom have been allowed to patent processes developed in their research laboratories. Patents themselves have become a measure of success, a method of accounting. Sherman states that "the impetus for these changes can be traced to the growing culture of public sector accountability that has developed in recent years and the general concern to 'maximise the returns made when public funds are involved' " (170).

John Law and Madeleine Akrich's essay, "On Customers and Costs: A Story from Public Sector Science," presents the results of a field study of a laboratory in the United Kingdom which had to change when the sources of its revenues changed. Although initially funded by the Science and Engineering Research Council, the facility had to search out new "customers" when funding decreased drastically in the 1980s. The essay provides an interesting analysis of how both the users of the facilities and the providers of the services had to change with the addition of "paying" customers at this historically public sector entity. The authors conclude "that the introduction of a space of economic calculability produces complex, contingent, and often unanticipated effects" (213).

In the next essay, "A Visible Hand in the Marketplace of Ideas: Precision Measurement as Arbitrage," Philip Mirowski argues that beginning with *quantitative* analogies makes a better starting place than *qualitative* ones. He demonstrates how measuring arbitrage can be extended to the measuring of scientific error and provides a brief history of error. Just as economics can provide measures for science, he suggests that the reverse can also be true, giving as an example Birge ratios (used by metrologists) applied to economic studies.

The final essay, "Toward a Philosophy of Science Accounting: A Critical Rendering of Instrumental Rationality," presents Steve Fuller's arguments concerning accountability for science. He presents four accountability conditions—discernibility, transcendence, responsibility and revisability—which provide a context for analysis. He concludes that if "the ends of science are not merely distinct but increasingly divergent from other societal ends, then greater efforts need to be made to render the two compatible" (277). This argument seems to resonate throughout the book.

ELIZABETH GOAD OLIVER
Associate Professor of Accounting

Washington and Lee University

GORDON V. SMITH, *Trademark Valuation* (New York: John Wiley & Sons, Inc., 1997, pp. 293).

It is increasingly apparent that the modern organization recognizes the importance of actively managing and protecting key intangible assets. One major obstacle to the management of these assets is the difficulty involved in valuation for both external and internal purposes. Gordon Smith provides a comprehensive guide to the valuation of trademarks that comprise part of the asset portfolio constituting a brand. Smith directs attention toward the trademark as a separate valuation issue. The strength of this reference book is its emphasis on the importance of the context of the trademark and its lack of identity as a separate asset. The notion that the trademark must be valued separately, but is tied to more comprehensive assets such as brands, makes the valuation issue difficult.

Smith's treatment of the valuation process, however, allows the reader to consider the multiple factors affecting the process.

Smith also offers a managerial perspective by including the trademark within the business enterprise. There are references throughout the book to the importance of managing the trademark as an asset and how to use the valuation for the maximum benefit of the entity.

The first three chapters are a primer on trademarks and provide a basis for later valuation chapters. In the introductory chapter, the author assumes that the reader has little knowledge of trademarks and uses a multitude of definitions and lists. Chapter 2 defines the various types of trademarks, and the third chapter stresses the exploitation of the trademark as positive and developmental. These chapters will be redundant for most business professionals, but will be extremely useful for students or academics who are unfamiliar with the basics of trademarks.

Chapters 4 and 5 review the determination of the economic benefit and economic life of the trademark. Estimating the potential economic benefit from ownership of the trademark is the first step in the valuation process. Even though trademarks seemingly have an endless life, they are subject to market fluctuation and legal forces that may affect their value. A consideration of these factors, combined with the economic benefit of the trademark, creates a comprehensive view of the trademark's value. The different mechanical methods of trademark valuation are discussed in chapter 6 and described with numerous examples.

Chapter 7 illustrates determination of trademark royalties—the cornerstone in deriving maximum value from a trademark. The protection of these rights and royalties is described in chapter 8 that discusses litigation with respect to monetary relief.

Chapters 9 and 10 exist almost as an afterthought on special situations such as trademarks in bankruptcy and global valuation issues. Even though chapter 10 emphasizes the global harmonization of trademark issues, this is a rapidly evolving area that requires a more in-depth discussion for serious readers.

The author provides an effective reference book for readers who are interested in trademarks and trademark valuation, but who are without extensive trademark knowledge. Smith draws on his many years of consulting experience to describe interesting examples and summarize virtually every area touching on the trademark valuation. The book illustrates a balanced view of valuation and encompasses a marketing component often overlooked in accounting and valuation treatments. Students and faculty researching valuation of intangible assets will find the book very useful. Practitioners will probably appreciate the book as an initial exposure to trademarks and trademark valuation rather than as an aid for more experienced managers.

KAREN S. CRAVENS

Assistant Professor

University of Tulsa

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- HUGH BRIAN MARKUS, *The History of the German Public Accounting Profession* (New York: Garland Publishing, Inc., 1997, pp. xvi, 354, Hb \$65).

- MATTHEW N. MURRAY and WILLIAM F. FOX, eds., *The Sales Tax in the 21st Century* (Westport, Ct: Praeger Publishers, 1997, pp. x, 265, Hb \$75).
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- RICHARD G. SCHROEDER and MYRTLE W. CLARK, *Accounting Theory: Text and Readings*, 6th edition. (New York: John Wiley & Sons, Inc., 1998, pp. x, 838).
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- JOHN C. WISDOM, *Preparing Loan Proposals*, 2nd edition. (New York: John Wiley & Sons, Inc., 1997, 741 pp., Hb \$125).

Erratum

Please note the following correction to the paper by Bala V. Balachandran, Ramji Balakrishnan and K. Sivaramakrishnan, "On the Efficiency of Cost-Based Decision Rules for Capacity Planning," *The Accounting Review* Vol. 72, No. 4 (October 1997): 599–619.

The following equations were printed incorrectly:

Let $f(d_i)$ represent the demand distribution for product i . Then, we can rewrite the objective function as:

$$\underset{L_j}{\text{Max}} \quad Tp \left\{ \int_0^{K_i} d_i f(d_i) dd_i + \int_{K_i}^{\infty} K_i f(d_i) dd_i \right\} - T \sum_j C_j L_j. \quad (3)$$

Noting that $L_j/m_{ij} = K_i$, $\forall j$, taking the first order condition with respect to L_j , some algebra yields:

$$\int_0^{K_i} f(d_i) dd_i = \frac{p - \sum_j C_j m_{ij}}{p} = \frac{\left\{ p - \sum_j C_j m_{ij} \right\}}{\left\{ p - \sum_j C_j m_{ij} \right\} + \sum_j C_j m_{ij}}. \quad (4)$$

They appeared in appendix A on page 617.

The Accounting Review sincerely regrets this printing error.

Editorial Data

Manuscripts submitted to *The Accounting Review* are assigned two reviewers. The following table contains information about turnaround time for reviewed manuscripts for the 12-month period ended June 30, 1997. Turnaround time is the number of days between the date of the editor's letter to the author(s) and the date that the manuscript and submission fee were received:

	<u>Number of Manuscripts</u>	<u>Cumulative Number</u>	<u>Cumulative Percent</u>
$0 \leq \text{Days} \leq 30$	6	6	2.2
$31 \leq \text{Days} \leq 60$	71	77	29.1
$61 \leq \text{Days} \leq 90$	104	181	68.3
$91 \leq \text{Days} \leq 120$	63	244	92.1
$121 \leq \text{Days}$	21	265	100.0

The mean and median review time was about 78 days. A limited number of manuscripts are returned without review and such manuscripts are excluded from the turnaround time statistics reported above.

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The efficiency and effectiveness of the editorial review process is critically dependent upon the actions of both authors submitting papers and the reviewers. Authors accept the responsibility of preparing research papers at a level suitable for evaluation by independent reviewers. Such preparation, therefore, should include subjecting the manuscript to critique by colleagues and others and revising it accordingly prior to submission. The review process is not to be used as a means of obtaining feedback at early stages of developing the research.

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- Dye, R., B. Balachandran, and R. Magee. 1989. Contingent fees for audit firms. Working paper, Northwestern University, Evanston, IL.
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- . 1984b. The perceived effects of tax policy on corporate investment intentions. *The Journal of the American Taxation Association* 6 (Fall): 7–19.
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Mark Kiel
 Department of Accounting
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 North Carolina A&T State University
 Greensboro, NC 27411
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 Fax: (910) 334-7093
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 Fax: (318) 482-5906
 Email: edcook@usl.edu

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 School of Management
 SUNY at Binghamton
 Binghamton, NY 13902-6015
 Phone: (607) 777-6174
 Fax: (607) 777-4422
 Email: sreiter@bingvmb.cc.binghamton.edu

Western

Judith A. Ramaglia
 School of Business
 Pacific Lutheran University
 Tacoma, WA 98447-0003
 Phone: (253) 535-7224
 Fax: (253) 535-8320
 Email: ramaglja@plu.edu

Ohio

Joyce S. Allen
 Xavier University
 3800 Victory Parkway
 Cincinnati, OH 45207-5161
 Phone: (513) 745-3471
 Fax: (513) 745-4383
 Email: jallen@xavier.xu.edu

SECTION AND GROUP OFFICERS**Accounting, Behavior and Organizations
Section***Immediate Past Chair*

Philip H. Siegel
 Department of Accounting
 School of Business Administration
 Monmouth University
 West Long Branch, NJ 07764-1898
 Phone: (908) 571-7523
 Fax: (908) 571-3656
 Email: psiegel@mondec.monmouth.edu

Chair

Dennis M. Bline
 Accounting Department
 Bryant College
 1150 Douglas Pike
 Smithfield, RI 02917-1284
 Phone: (401) 232-6402
 Fax: (401) 232-6319
 Email: dbline@keynes.bryant.edu

Chair-Elect

Seleshi Sisaye
 Palumbo School of Business Administration
 Duquesne University
 Pittsburgh, PA 15280-0104
 Phone: (412) 396-6274
 Fax: (412) 396-4764
 Email: sisaye@duq2.cc.duq.edu

Secretary/Treasurer

Vicky Arnold
 Department of Accounting and Finance
 College of Business and Industry
 University of Massachusetts Dartmouth
 285 Old Westport Road
 North Dartmouth, MA 02747-2300
 Phone: (508) 999-8426
 Fax: (508) 999-8776
 Email: varnold@umassd.edu

Administrators of Accounting Programs Group**President**

David R. Campbell
 Department of Accountancy
 Weatherhead School of Management
 Case Western Reserve University
 Cleveland, OH 44106-7235
 Phone: (216) 368-5479
 Fax: (216) 368-4776
 Email: drc3@po.cwru.edu

Vice President/President-Elect

Russell M. Barefield
 J. M. Tull School of Accounting
 Terry College of Business Administration
 University of Georgia
 Athens, GA 30602-6252
 Phone: (706) 542-3602
 Fax: (706) 542-7196
 Email: rbarefield@cbacc.cba.uga.edu

Vice President-Accreditation

Keith G. Stanga
 Department of Accounting and Business Law
 College of Business Administration
 University of Tennessee
 Knoxville, TN 37996-0560
 Phone: (423) 974-1758
 Fax: (423) 974-4631
 Email: kstanga@utk.edu

Vice Chair (Regions)

Gene Johnson
 CAB-Accounting
 Louisiana Tech University
 PO Box 10318 T.S.
 Ruston, LA 71272
 Phone: (318) 257-3984
 Fax: (318) 251-8130
 Email: johnson@cab.latech.edu

Secretary

Kenneth L. Paige
 Accounting Faculty
 Palumbo School of Business Administration
 Duquesne University
 600 Forbes Avenue
 Pittsburgh, PA 15282-0104
 Phone: (412) 396-6271
 Fax: (412) 396-4764
 Email: paige@duq3.duq.edu

Treasurer

James A. Heintz
 Department of Accounting U-41A
 School of Business Administration
 University of Connecticut
 368 Fairfield Road
 Storrs, CT 06269-2041
 Phone: (860) 486-3018
 Fax: (860) 486-4838
 Email: accctadm6@uconnvm.uconn.edu

American Taxation Association Section*President*

Sandra S. Kramer
Fisher School of Accounting
College of Business Administration
University of Florida
PO Box 117166
Gainesville, FL 32611-7166
Phone: (352) 392-8898
Fax: (352) 392-7962
Email: skramer@dale.cba.ufl.edu

Vice President-Elect

Daniel P. Murphy
Department of Accounting and Business Law
College of Business Administration
University of Tennessee
916 Volunteer Road
Knoxville, TN 37996-0560
Phone: (423) 974-1752
Fax: (423) 974-4631
Email: dmurphy@utk.edu

President-Elect

Richard P. Weber
Department of Accounting
Eli Broad Graduate School of Management
Michigan State University
East Lansing, MI 48824-1121
Phone: (517) 432-2925
Fax: (517) 432-1101
Email: 21726rpw@msu.edu

Secretary

Jeffery D. Gramlich
School of Accountancy
College of Business and Administration
University of Hawaii at Manoa
2401 Maile Way
Honolulu, HI 96822
Phone: (808) 956-8063
Fax: (808) 956-9888
Email: gramlich@hawaii.edu

Vice President

Frances L. Ayres
School of Accountancy
College of Business Administration
University of Oklahoma
Norman, OK 73019-0450
Phone: (405) 325-4221
Fax: (405) 325-7688
Email: fayres@ou.edu

Treasurer

Robert L. Gardner
School of Accountancy and Information
Systems
Marriott School of Management
Brigham Young University
Provo, UT 84602
Phone: (801) 378-3212
Fax: (801) 378-5933
Email: robert_gardner@byu.edu

Artificial Intelligence/Emerging Technologies Section*Chairperson*

Anthony K. P. Wensley
Faculty of Management
University of Toronto
105 St. George Street
Toronto Ontario M5S 3E6
CANADA
Phone: (905) 828-5318
Fax: (905) 569-4302
Email: wensle@fmgmt.mgmt.utoronto.ca

Vice Chairperson

Alan J. A. Sangster
The Queen's School of Management
The Queen's University, Belfast
Belfast BT7 1NN
UNITED KINGDOM
Phone: 44 1232319530
Fax: 44 1232326921
Email: sangster@netcomuk.co.uk

Chairperson-Elect

William E. McCarthy
Eli Broad Graduate School of Management
Michigan State University
East Lansing, MI 48824-1121
Phone: (517) 432-2913
Fax: (517) 432-1101
Email: 21277wem@msu.edu

Auditing Section*President*

Barry E. Cushing
 School of Accounting
 David Eccles School of Business
 University of Utah
 Salt Lake City, UT 84112
 Phone: (801) 585-3577
 Fax: (801) 581-7214
 Email: actbec@business.utah.edu

Vice President-Practice

Dennis Schueler
 Price Waterhouse
 200 East Randolph Drive
 Chicago, IL 60601
 Phone: (312) 540-2230
 Fax: (312) 565-1540
 Email: dennisschueler@notes.pw.com

Past President

Jane F. Mutchler
 Department of Accounting
 Smeal College of Business Administration
 Pennsylvania State University
 University Park, PA 16802-1912
 Phone: (814) 863-3569
 Fax: (814) 863-8393
 Email: jfm5@psu.edu

Secretary

Lisa L. Koonce
 Department of Accounting
 CBA 4M.202
 University of Texas at Austin
 Austin, TX 78712
 Phone: (512) 471-5576
 Fax: (512) 471-3904
 Email: lisakoonce@mail.utexas.edu

Vice President-Academics

Timothy B. Bell
 KPMG Peat Marwick
 Three Chestnut Ridge Road
 Montvale, NJ 07645
 Phone: (201) 307-7321
 Fax: (201) 307-8046
 Email: tbell@kpmg.com

Treasurer

Joseph V. Carcello
 Department of Accounting and Business Law
 College of Business Administration
 University of Tennessee
 Knoxville, TN 37996-0560
 Phone: (423) 974-1757
 Fax: (423) 974-4631
 Email: jcarcell@utk.edu

Financial Accounting and Reporting Section*President*

Robert J. Swieringa
 Johnson Graduate School of Management
 Cornell University
 303 Malott Hall
 Ithaca, NY 14853-4201
 Phone: (607) 255-6418
 Fax: (607) 254-8886
 Email: rjs22@cornell.edu

Vice President (from Practice)

John T. Smith, Partner
 Deloitte & Touche
 10 Westport Drive
 Wilton, CT 06897
 Phone: (203) 761-3199
 Fax: (203) 761-3513
 Email: u8993@snet.net

President-Elect

Gregory B. Waymire
 Goizueta Business School
 Emory University
 1602 Mizell Drive
 Atlanta, GA 30322-2710
 Phone: (404) 727-6679
 Fax: (404) 727-6313
 Email: gregory_waymire@bus.emory.edu

Secretary/Treasurer

Thomas F. Schaefer
 College of Business
 Florida State University
 Tallahassee, FL 32306-1042
 Phone: (904) 644-7892
 Fax: (904) 644-8234
 Email: tshaef@cob.fsu.edu

Immediate Past President

Wayne R. Landsman
 Accounting Faculty—CB3490
 Kenan-Flagler Business School
 University of North Carolina at Chapel Hill
 Chapel Hill, NC 27599-3490
 Phone: (919) 962-3221
 Fax: (919) 962-0054
 Email: wayne_landsman@unc.edu

Gender Issues in Accounting Section*Chairperson*

M. Jeanne Welsh
 Department of Accounting—Box 332
 La Salle University
 1900 West Olney Avenue
 Philadelphia, PA 19141
 Phone: (215) 951-1883
 Fax: (215) 951-1488
 Email: welsh@lasalle.edu

Vice Chairperson, Director of Research

Wayne G. Bremser
 Department of Accountancy
 College of Commerce and Finance
 Villanova University
 Villanova, PA 19085-1678
 Phone: (610) 519-4314
 Fax: (610) 519-5204
 Email: drwayneb@zola.trend1.com

Chairperson-Elect

Suzanne Pinac Ward
 Department of Accounting
 University of Southwestern Louisiana
 PO Box 43450 USL
 Lafayette, LA 70504
 Phone: (318) 482-6085
 Fax: (318) 482-5906
 Email: spw6813@usl.edu

Secretary/Treasurer

Dana L. Gibson
 Accounting Faculty
 Texas Woman's University
 1322 Oakland Avenue
 Denton, TX 76204-1805
 Phone: (817) 898-2115
 Fax: (817) 898-2120
 Email: f_gibson@twu.edu

Government and Nonprofit Section*Chairperson*

Rhoda C. Icerman
 College of Business
 Florida State University
 Tallahassee, FL 32306-1042
 Phone: (850) 644-7874
 Fax: (850) 644-8234
 Email: ricerma@cob.fsu.edu

Vice President for Practice

Walter F. Kelly
 Clifton Gunderson, LLP
 Suite 400, 2 Park Fletcher
 5420 West Southern Avenue
 Indianapolis, IN 46241-5535
 Phone: (317) 484-0534
 Fax: (317) 484-0552
 Email: wfkelly@iquest

Chairperson-Elect

Judith K. Welch
 School of Accounting
 College of Business Administration
 University of Central Florida
 Orlando, FL 32816-1400
 Phone: (407) 823-5659
 Fax: (407) 823-5741
 Email: fdjwelch@pegasus.cc.ucf.edu

Secretary/Treasurer

Marc A. Rubin
 Department of Accounting
 R. T. Farmer School of Business
 Administration
 Miami University
 Oxford, OH 45056-1675
 Phone: (513) 529-3381
 Fax: (513) 529-6992
 Email: marubin@sba-laws.sba.muioio.edu

Information Systems Section*Chairperson*

Steve G. Sutton
Bryant College
1150 Douglas Pike
Smithfield, RI 02917-1285
Phone: (401) 232-6129
Fax: (401) 232-6319
Email: ssutton@research1.bryant.edu

Vice Chairperson-Academic/Chairperson-Elect

Stewart A. Leech
Department of Accounting and Finance
University of Tasmania
French Street
Hobart Tasmania 7005
AUSTRALIA
Phone: 61 02202266
Fax: 61 02207845
Email: stewart.leech@accfin.utas.edu.au

Vice Chairperson-Practice

Dan Schmidt
KPMG Peat Marwick
Suite 2000
3 Embarcadero Center
San Francisco, CA 94111
Phone: (415) 951-7538

Treasurer

Vairam Arunachalam
School of Accountancy
University of Missouri-Columbia
Columbia, MO 65211
Phone: (573) 882-1935
Fax: (573) 882-2437
Email: arunachalam@bpa.missouri.edu

International Accounting Section*Chairperson*

Shahrokh M. Saudagaran
Santa Clara University
1267 Oakglen Way
San Jose, CA 95120
Phone: (408) 554-4894
Fax: (408) 927-7500
Email: ssaudagaran@scuacc.scu.edu

Secretary

Ralph E. Viator
School of Accountancy
University of Kentucky
Lexington, KY 40506-0034
Phone: (606) 257-3876
Fax: (606) 257-3654
Email: acc205@pop.uky.edu

Historian

Julie Smith-David
School of Accountancy
Arizona State University
Tempe, AZ 85287-3606
Phone: (602) 965-8603
Fax: (602) 965-8392
Email: julie.smith.david@asu.edu

Webmaster

Rayman D. Meservy
School of Accountancy and Information
Systems
Brigham Young University
Provo, UT 84602
Phone: (801) 378-2119
Fax: (801) 378-5933
Email: rayman_meservy@byu.edu

Vice Chairperson-Academic

Hans J. Dykxhoorn
Haworth College of Business
Western Michigan University
Kalamazoo, MI 49008-3899
Phone: (616) 387-5264
Fax: (616) 387-5710
Email: hans.dykxhoorn@wmich.edu

Vice Chairperson-Practice

Patricia D. McQueen
 Association for Investment Management and
 Research (AIMR)
 5 Boar's Head Lane
 PO Box 3668
 Charlottesville, VA 22903
 Phone: (804) 980-9701
 Fax: (804) 980-9730
 Email: pdm@aimr.com

Secretary

Stephen B. Salter
 College of Business Administration
 University of Cincinnati
 Cincinnati, OH 45221-0211
 Phone: (513) 556-7056
 Fax: (513) 556-4891
 Email: ssalter@ucbeh.san.uc.edu

Treasurer

Timothy S. Doupnik
 College of Business Administration
 University of South Carolina
 Columbia, SC 29208
 Phone: (803) 777-7450
 Fax: (803) 777-6876
 Email: doupnik@darla.badm.sc.edu

Management Accounting Section*President*

John H. (Harry) Evans III
 Katz Graduate School of Business
 University of Pittsburgh
 Pittsburgh, PA 15260
 Phone: (412) 648-1714
 Fax: (412) 648-1693
 Email: jhe@katz.business.pitt.edu

President-Elect

Michael W. Maher
 Graduate School of Management
 University of California, Davis
 Davis, CA 95616-8609
 Phone: (916) 752-7034
 Fax: (916) 752-2924
 Email: mwmaher@ucdavis.edu

Past President

Hadley P. Schaefer
 Fisher School of Accounting
 College of Business Administration
 University of Florida
 PO Box 117160
 Gainesville, FL 32611-7160
 Phone: (352) 392-8886
 Fax: (352) 392-7962
 Email: schaefer@dale.cba.ufl.edu

Secretary/Treasurer

Ella Mae Matsumura
 School of Business
 University of Wisconsin-Madison
 Madison, WI 53706-1323
 Phone: (608) 262-9731
 Fax: (608) 263-0477
 Email: ematsumura@bus.wisc.edu

Public Interest Section*President*

Timothy J. Fogarty
 Department of Accounting
 Weatherhead School of Management
 Case Western Reserve University
 10900 Euclid Avenue
 Cleveland, OH 44106-7235
 Phone: (216) 368-3938
 Fax: (216) 368-4776
 Email: tfj@po.cwru.edu

President-Elect

Lee D. Parker
 Faculty of Economics and Commerce
 University of Adelaide
 Adelaide 5005
 SOUTH AUSTRALIA
 Phone: 61 83034755
 Fax: 61 83034368
 Email: lparker@economics.adelaide.edu.au

Secretary/Treasurer

Mary Beth Armstrong
Accounting Department
College of Business
California Polytechnic State University
San Luis Obispo, CA 93407
Phone: (805) 756-2084
Fax: (805) 756-1473

Director of Research

Leslie S. Oakes
R O Anderson School of Management
University of New Mexico
1924 Las Lomas
Albuquerque, NM 87131
Phone: (505) 277-8442
Fax: (505) 277-7108

Teaching and Curriculum Section*Chairperson*

Billie M. Cunningham
School of Accountancy
College of Business and Public
Administration
University of Missouri-Columbia
Columbia, MO 65211-6100
Phone: (573) 882-5665
Fax: (573) 882-2437
Email: cunningham@bpa.missouri.edu

Secretary

Sandra D. Byrd
School of Accountancy
College of Business
Southwest Missouri State University
Springfield, MO 65804-0094
Phone: (417) 836-4181
Fax: (417) 836-6337
Email: sdb196f@wpgate.smsu.edu

Vice Chairperson-Academic

Kevin D. Stocks
School of Accountancy and Business
Systems
Marriott School of Management
Brigham Young University
Provo, UT 84602
Phone: (801) 378-4613
Fax: (801) 378-5933
Email: kevin_stocks@msni.byu.edu

Treasurer

Donald E. Wygal
Department of Accounting
Rider University
2083 Lawrenceville Road
Lawrenceville, NJ 08648-3099
Phone: (609) 895-5543
Fax: (609) 896-5304
Email: wygal@enigma.rider.edu

Vice Chairperson-Practice

Catherine Delesky
Price Waterhouse LLP
1251 Avenue of the Americas
New York, NY 10020
Phone: (212) 819-5121
Fax: (212) 790-6625
Email: delesky@notes.pw.com

Two-Year College Section*Chairperson*

John Ribezzo
Community College of Rhode Island
400 East Avenue
Warwick, RI 02886
Phone: (401) 825-2252
Fax: (401) 825-2365
Email: jribezzo@ccri.cc.ri.us

Vice Chairperson

Margaret F. Criner
University College-University of Maine
210 Texas Avenue
Bangor, ME 04401
Phone: (207) 581-6067
Fax: (207) 581-6069
Email: mcriner@maine.maine.edu

Secretary/Editor

Dick Wasson
Southwestern College
900 Otay Lakes Road
Chula Vista, CA 91912
Phone: (619) 421-6700 ext. 5537

*Coordinator of Regional Representatives/
Officer-at-Large*

Ellen L. Sweatt
DeKalb College—North Campus
2101 Womack Road
Dunwoody, GA 30338
Phone: (770) 551-3086
Fax: (770) 604-3795
Email: esweatt@dekalb.dc.peachnet.edu

COMMITTEE CHARGES**ACCOUNTING ACCREDITATION COMMITTEE**

Charge: To monitor issues and developments in accreditation that may have an impact on accounting programs—specifically:

1. To review the three previous committees' reports and other important background material.
2. To follow the accreditation activities of the AACSB, as well as other developments in accreditation.
3. To coordinate closely with the Administrators of Accounting Programs Group in developing accreditation resources for department chairs. (Review recent accreditation visits and reports, and identify common strengths, weaknesses and needs of accounting programs.)
4. To inform the Executive Committee of accreditation issues as they arise and recommend policies or positions as appropriate.
5. To provide accreditation resources on the Internet for AAA members.
6. To study the curriculum requirements of AACSB accounting accreditation to see if they are too narrow and restrictive, and to make recommendations to the AACSB.

Chair:

Keith G. Stanga
Department of Accounting and Business Law
College of Business Administration
University of Tennessee
Knoxville, TN 37996-0560
Phone: (423) 974-1758
Fax: (423) 974-4631
Email: kstanga@utk.edu

Membership:

Clifford R. Skousen, Utah State
George Krull, Grant Thornton
Abdel M. Agami, Old Dominion University
Doug Snowball, University of Florida
Anne J. Rich, Quinnipiac College
James A. Heintz, University of Connecticut
Larry Scott, AEAC Liaison, Price Waterhouse LLP
Richard E. Baker, Liaison, Executive Committee, Northern Illinois University

ACCOUNTING EDUCATION ADVISORY COMMITTEE**(Standing Committee of the Association)**

Charge: To serve as the senior committee for Association activities that involve accounting education—specifically:

1. To review the three previous committees' reports and other important background material, including the report of the 1996–97 Continuing Education Committee.
2. To develop and issue position statements on matters relating to accounting education.
3. To develop and recommend to the Executive Committee educational policies for the Association.
4. To coordinate the activities of the Association in the field of accounting education, with emphasis on accounting education research, publication and dissemination.
5. To work with the Research Advisory Committee (RAC) and the new faculty development director to coordinate and implement the Association's faculty program development activity—including:
 - a. Coordination of faculty and program development among the Accounting Education Advisory Committee, the Research Advisory Committee, the Electronic Materials and Dissemination

Committee, sponsoring organizations, headquarters' personnel and the new faculty development director.

- b. Consideration of recommendations from committees charged to improve member services, such as the Membership Services and Subscriptions Committee, the Committee to Promote Interaction Between Two-Year College Faculty and Faculty at Other Institutions, and the Globalization Initiatives Committee.
- c. Evaluation of alternatives to improve the efficiency and effectiveness of processes used in implementing faculty and program development.
- d. Proposal of a detailed budget, in conjunction with the Executive Director and the Director of Faculty Development, to the Executive Committee and allocate, where authorized, funds specifically designated for this function, including any grants that might be a part of the program.
- e. To conduct the continuing education program at the annual convention.
- f. To implement Continuing Education (CE) initiatives. As part of the implementation, consider:
 1. Acquisition from existing sources, such as accounting firms, companies and professional organizations.
 2. Development of courses or materials from competent preparers.
- g. To evaluate the need for modifications in CE courses and materials through participant exit measures.
- h. To consider the need for CE delivery venues other than the Annual, Section and Region meetings, including:
 1. State-wide accounting educators' associations.
 2. Large metropolitan areas.
 3. Alliances with professional organizations.
- i. To refine the matrix of competencies by soliciting input from various interest groups (sections) and members with different intellectual interests.
- j. To work with the RAC, the faculty development director, Regions, Sections and the Program Advisory Committee to suggest and sponsor educators' (teaching, curriculum, etc.) sessions at national, Regional and Section meetings.
- k. To file progress reports with the Director of Education and the Executive Committee by October 31, 1997, February 28, 1998, and July 15, 1998.
6. To assist education-designated committees, such as the New Faculty Consortium Planning Committee, the Innovations in Accounting Education Award Committee and the Professional Examinations Committee.

Chair: Richard E. Baker
 Department of Accountancy
 College of Business
 Northern Illinois University
 DeKalb, IL 60115-2854
 Phone: (815) 753-6205
 Fax: (815) 753-8515
 Email: rbaker@niu.edu

Membership: Lynn Mazzola, Nassau Community College
 Belverd E. Needles, Jr., DePaul University
 Leroy J. Pryor, California State University
 Larry Scott, Price Waterhouse LLP
 Paul E. Solomon, San Jose State University
 James D. Stice, Brigham Young University
 Grace Pownall, Emory University
 Ella Mae Matsumura, University of Wisconsin-Madison
 Alexander L. Gabbin, James Madison University

AICPA/AAA COLLABORATIVE AWARD SELECTION COMMITTEE
(Joint with the AICPA)

Charge: To select the recipient(s) of the award according to the agreement between the AICPA and the Association.

Chair: Dana R. Hermanson
 Department of Accounting
 Coles School of Business
 Kennesaw State College
 1000 Chastain Road
 Kennesaw, GA 30144-5591
 Phone: (770) 423-6077
 Fax: (770) 499-3420
 Email: dhermanson@kscuna1.kennesaw.edu

Membership: Susan L. Porter, University of Texas at Austin
 Nabil S. Elias, University of Manitoba
 D. Jordan Lowe, Virginia Polytechnic and State University
 P. Jane Saly, University of Minnesota
 Larry R. Davis, Michigan Technological University
 G. Peter Wilson, Liaison, AAA Executive Committee, Boston College

ANNUAL MEETING REVIEW COMMITTEE

Charge:

1. To review the format of the Annual Meeting and suggest ways, if any, in which the Association can better serve its members and attract a greater attendance at the annual convention. Your review should examine all aspects of the Annual Meeting but should pay special attention to the following issues:
 - a. The mix of plenary vs. concurrent sessions.
 - b. The timing of the business meeting.
 - c. The section business meetings and their impact on the conference.
 - d. Receptions, meals and other social functions to determine if any should be modified, deleted or added.
 - e. Pricing of the convention and its events.
 - f. How closely continuing education is tied to conference. Should CE sessions be included in registration fee.
2. Present a written report to your executive committee liaison by March 15, 1998.

Chair: Larry E. Rittenberg
 Department of Accounting and Information Systems
 School of Business
 University of Wisconsin-Madison
 975 University Avenue
 Madison, WI 53706-1323
 Phone: (608) 262-2267
 Fax: (608) 263-0477
 Email: lrittenberg@bus.wisc.edu

Membership: Robert W. Ingram, University of Alabama
 Wilda F. Meixner, Southwest Texas State University
 E. James Burton, Middle Tennessee State University
 W. Morley Lemon, University of Waterloo
 William A. Raabe, Samford University
 Michael A. Diamond, Liaison AAA Executive Committee, University of Southern California

BY-LAWS COMMITTEE (Standing Committee of the Association)

Charge:

1. To review the three previous committees' reports and other important background material.
2. To review existing Association's By-Laws and recommend revisions where conflicts exist to the Executive Committee.
3. To analyze any proposed changes in the By-Laws and recommend to the Executive Committee changes in form or conflicts that are not anticipated by such proposals.
4. To assist the Governance Committee by drafting proposed changes and/or amendments as they are recommended and are approved by the Executive Committee and Council.

Chair: Charles L. McDonald
Fisher School of Accounting
College of Business and Administration
University of Florida
Gainesville, FL 32611-7166
Phone: (352) 392-8880
Fax: (352) 392-7962
Email: mcdonacl@dale.cba.ufl.edu

Membership: Mark Kiel, North Carolina A&T University
O. Ray Whittington, De Paul University
Karen L. Hooks, Liaison, AAA Executive Committee, Florida Atlantic University

CARTER SCHOLARSHIPS COMMITTEE

Charge:

1. To review the three previous committees' reports and other important background material.
2. To recommend recipients for the Arthur H. Carter Foundation Student Scholarships—specifically:
 - a. To collect and evaluate applications for the Carter Foundation Scholarships.
 - b. To rank the applications received.
 - c. To transmit the rankings to the trustees of the Foundation.

Chair: Teddy L. Coe
Department of Accounting
College of Business Administration
University of North Texas
Denton, TX 76203-6677
Phone: (817) 565-3095
Fax: (817) 565-3803

Membership: James E. Parker, University of Missouri
Alan N. Attaway, University of Louisville
Robert Bloom, John Carroll University
Alexander L. Gabbin, AEAC Liaison, James Madison University
Richard E. Baker, Liaison, AAA Executive Committee, Northern Illinois University

CHANGING ENVIRONMENT COMMITTEE

Charge:

1. To examine the changes taking place in higher education, business schools, and accounting and information systems programs. Your examination should include looking at all changes affecting AAA membership, but should pay particular attention to the following:
 - a. Changes taking place in the markets for our graduates (e.g., CPA firms, consulting firms, industry, government, etc.) and the tasks they will be asked to perform.
 - b. Changes taking place in the way accounting education is being delivered (e.g., corporate universities, elimination of tenure at state and private schools, etc.). You do not need to examine changes in pedagogy, course content and structure of existing programs. (That is the charge of the AEAC, RAC and faculty development director.)
 - c. Changes taking place in the demographics and demand for our programs by students entering accounting and information systems programs.

2. Recommend actions the AAA or its members can take to respond to the changing environment (e.g., should corporate university faculty be welcomed into and serviced by the AAA even though they may pose a threat to existing members and their institutions).
3. Deliver a report to the executive committee liaison by July 15, 1998.

Chair: Richard B. Lea
 Department of Accounting and Management Information Systems
 College of Business
 California State University, Chico
 Chico, CA 95929-0011
 Phone: (916) 898-6215
 Fax: (916) 898-4584
 Email: rlea@oavax.csuchico.edu

Membership: Richard E. Flaherty, Arizona State University
 Charles G. Carpenter, Miami University
 Gary L. Sundem, University of Washington
 Ellen Glazerman, Ernst & Young
 D. Gerald Searfoss, University of Utah
 Elizabeth G. Oliver, Washington and Lee University
 Bruce H. Butterwick, Independent Consultant
 Fred Wu, University of North Texas
 Paul E. Solomon, AEAC Liaison, San Jose State University
 G. Peter Wilson, Liaison, AAA Executive Committee, Boston College

COMMITTEE TO PROMOTE INTERACTION BETWEEN TWO-YEAR COLLEGE FACULTY AND FACULTY AT OTHER INSTITUTIONS

Charge: To facilitate interaction between two-year faculty and the activities of four-year and graduate colleges—specifically:

1. To review the three previous committees' reports and other important background material.
2. To recommend measures to the Executive Committee that will serve the AAA's two-year college members and prospective members. In carrying out this aspect of the charge, the Committee should exchange information with the Membership Services and Subscriptions Committee.
3. To promote membership of two-year college faculty in the Association, including assisting with any membership initiatives by the Membership Services and Subscriptions Committee, regions, sections, or other appropriate bodies in the Association.
4. To contribute to effective instructional initiatives undertaken by headquarters' staff involved in faculty and program development, the regions and the sections.
5. To encourage four- and five-year schools that have high numbers of transfers from two-year schools to work closely (through seminars, etc.) with their major two-year providers and the AAA faculty development director to ensure that curricula are current, that critical skills and knowledge are being taught, and that they are keeping pace with the rapidly changing business environment.
6. To determine how two-year members can fit better in the AAA, whether there should be a two-tiered dues structure, and how the AAA can better serve two-year members.

Co-Chairs: Susan Crosson	Alan Reinstein
Director of Business Programs	Department of Accounting
Santa Fe Community College	School of Business Administration
3000 NW 83rd Street	Wayne State University
Gainesville, FL 32606	Detroit, MI 48202
Phone: (352) 395-5137	Phone: (313) 577-4579
Fax: (352) 395-4127	Fax: (313) 577-2000
Email: susan.crosson@santafe.cc.fl.us	

Membership: Janet Cassagio, Nassau Community College
 David H. Lindsay, California State University, Stanislaus
 Donna Hall, Andover College
 Donna Ulmer, St. Louis Community College
 Lou Squyres, DeKalb College
 Lynn Mazzola, AEAC Liaison, Nassau Community College
 Richard E. Baker, Liaison, AAA Executive Committee, Northern Illinois University

COMPETITIVE MANUSCRIPT COMMITTEE

Charge: To select one, two or (at most) three recipient(s) of the Competitive Manuscript Award, using criteria approved by the Executive Committee.

Chair: Jeffrey D. Gramlich
School of Accountancy
College of Business Administration
University of Hawaii at Manoa
2404 Maile Way
Honolulu, HI 96822
Phone: (808) 956-7332
Fax: (808) 956-9888

Membership: Brett Trueman, University of California at Berkeley
Joan L. Luft, Michigan State University
James McKeown, Pennsylvania State University
Eric G. Press, Temple University
George J. Walendowski, Los Angeles City College
Kathy R. Petroni, RAC Liaison, Michigan State University
Julie H. Collins, Liaison, AAA Executive Committee, University of North Carolina at Chapel Hill

CORPORATE ACCOUNTING POLICY SEMINAR COMMITTEE

Charge: To plan and hold the Corporate Accounting Policy Seminar in accordance with established AAA policies—specifically:

1. To review the three previous committees' reports and other important background material.
2. To plan for and arrange to have the 1998 seminar conducted and administered.
3. To ensure that adequate funding is received to pay for the Corporate Accounting Policy Seminar.
4. To keep the AAA membership, through the Internet or other means, informed of:
 - a. Developments in the corporate accounting community;
 - b. Research opportunities in the corporate accounting sector.
5. To report on the results and effectiveness of the seminar and to recommend any changes to the Executive Committee by October 15, 1998.

Chair: Mary E. Barth
Accounting Faculty
Graduate School of Business
Stanford University
Stanford, CA 94305-5015
Phone: (415) 723-8536
Fax: (415) 725-7979
Email: fbarth@gsb-lira.stanford.edu

Membership: Melvin C. O'Connor, Michigan State University
Richard G. Sloan, University of Michigan
Steve Berlin, Citgo Petroleum
William J. Ihlanfeldt, IMA
Joseph Martin, IBM
Dan Sansone, Vulcan Materials, Inc.
Linda S. Bamber, RAC Liaison, University of Georgia
Leroy J. Pryor, AEAC Liaison, California State University, Chico
Julie H. Collins, Liaison, AAA Executive Committee, University of North Carolina at Chapel Hill

DELOITTE & TOUCHE WILDMAN MEDAL AWARD COMMITTEE

Charge: To administer the John R. Wildman Medal award program in accordance with the terms of the grant from the Deloitte & Touche Foundation.

Chair: Terrence J. Shevlin
 Department of Accounting
 School of Business Administration
 University of Washington
 Seattle, WA 98195
 Phone: (206) 543-7223
 Fax: (206) 685-9392
 Email: shevlin@u.washington.edu

Membership: Timothy D. West, Iowa State University
 Mark Chain, Deloitte & Touche
 Thomas G. Evans, University of Central Florida
 P. David Shields, American Graduate School of International Management
 Niamh Brennan, University College-Dublin
 Philip Shane, Pennsylvania State University
 Kurt J. Pany, Arizona State University
 Maureen F. McNichols, RAC Liaison, Stanford University
 G. Peter Wilson, Liaison, AAA Executive Committee, Boston College

DISTINGUISHED INTERNATIONAL FACULTY EXCHANGE COMMITTEE

Charge: To oversee the faculty exchange program and assist Association staff in the administration of the program—specifically:

1. To review the three previous committees' reports and other important background material.
2. To select the U.S./Canadian professors to be involved in the program for the 1999 tour and to select the schools in the United States and Canada for the 1998 lecture tour.
3. To select the area for the 2000 visit.
4. To assist the Executive Director with announcements, arrangements and follow-up evaluations for the respective visits.

Chair: Gary K. Meek
 School of Accounting
 College of Business Administration
 Oklahoma State University
 Stillwater, OK 74078-0555
 Phone: (405) 744-5100
 Fax: (405) 744-5180
 Email: gmeek@okway.okstate.edu

Membership: Clare B. Roberts, University of Aberdeen
 James L. Chan, University of Illinois at Chicago
 Michele J. Daley, Rice University
 John L. Kramer, University of Florida
 Terry Campbell, CIMID
 Hema Rao, SUNY at Utica/Rome
 Kazuo Hiramatsu, Kwansei Gakuin University
 Joseph J. Schultz, Jr., Liaison, AAA Executive Committee, Arizona State University

DOCTORAL CONSORTIUM COMMITTEE

Charge: To plan and hold the 1998 Doctoral Consortium in accordance with established AAA policies—specifically:

1. To review the three previous committees' reports and other important background material.
2. To plan for and arrange to have the 1998 consortium conducted and administered.
3. To report on the results and effectiveness of the consortium and to recommend any changes to the Executive Committee by August 31, 1998.

Chair: Mary S. Stone
 Culverhouse School of Accountancy
 Commerce and Business Administration
 University of Alabama
 314 Alston Hall
 Tuscaloosa, AL 35487-0220
 Phone: (205) 348-2915
 Fax: (205) 348-8453
 Email: mstone@alston.cba.ua.edu

Membership: Jean C. Bedard, Northeastern University
 E. Michael Bamber, University of Georgia
 Ronald R. King, Washington University
 Jennifer Francis, University of Chicago
 William R. Kinney, Jr., RAC Liaison, University of Texas at Austin
 Julie H. Collins, Liaison, AAA Executive Committee, University of North Carolina at Chapel Hill

DOCTORAL FELLOWSHIPS COMMITTEE

Charge:

1. To review the three previous committees' reports and other important background material.
2. To select the 1997-98 recipients of the American Accounting Association doctoral fellowship grants using the criteria established by the Executive Committee.
3. To evaluate the doctoral fellowship grant program and recommend changes, as appropriate, to the Executive Committee.

Chair: Jacob G. Birnberg
 Katz Graduate School of Business
 University of Pittsburgh
 Pittsburgh, PA 15260
 Phone: (412) 648-1719
 Fax: (412) 648-1693
 Email: birnberg@katz.business.pitt.edu

Membership: Sally M. Jones, University of Virginia
 Donald L. Madden, University of Kentucky
 Sally Wright, University of Massachusetts Boston
 J. Owen Cherrington, Brigham Young University
 Kenneth J. Euske, Naval Postgraduate School
 Donald V. Moser, University of Pittsburgh
 Belverd E. Needles, Jr., AEAC Liaison, DePaul University
 G. Peter Wilson, Liaison, AAA Executive Committee, Boston College

ELECTRONIC MATERIALS DISSEMINATION COMMITTEE

Charge: To assist in maximizing use of the Internet and other electronic media in the Association's faculty and program development activities—specifically:

1. To review the three previous committees' reports and other important background material.
2. To develop a three-year operational plan, with an assessment of alternatives, to guide Executive Committee actions for gathering and disseminating materials and data electronically among members, including:
 - a. Consulting with headquarters' personnel to select an appropriate platform for ongoing use of the Internet among members, particularly as related to faculty and program development.
 - b. Identifying areas where existing electronic materials and training courses are inadequate, and developing plans for remedying the inadequacy, including, for example, the development of materials or training programs for members. In this charge, coordinate with the section and region webmasters, appropriate headquarters' personnel, the Faculty Development Advisory Committee, and others, as appropriate.
3. To assist in refining and implementing plans adopted by the Executive Committee.
4. To continue development activities for the Association's home page, including amassing as much material as practicable for members to reference via the home page. In this charge, coordinate with the section and region webmasters, appropriate headquarters' personnel and others, as appropriate.
5. With the assistance of several task forces, if needed, to:
 - a. Work with the AEAC to place innovative syllabi and program descriptions on the Internet.
 - b. Assist the AEAC in placing the faculty development competency matrix and other materials on the Internet.
 - c. Place the AAA Policy and Procedures Manual on the Internet.
 - d. Establish an AAA placement service where students (particularly at schools that recruiters don't visit), for a small fee, can put their resumes on the Internet.
6. Assist the Director of Faculty Development, Executive Committee, Executive Director, AEAC and RAC, as needed, to place other services and information on the Internet.

Chair: Clinton E. White, Jr.
 Department of Accounting
 College of Business and Economics
 University of Delaware
 South College Avenue
 Newark, DE 19716
 Phone: (302) 831-6902
 Fax: (302) 831-6750
 Email: skipw@udel.edu

Membership: William F. Yancey, Texas Christian University
 Khondkar Karim, Monmouth University
 David R. Campbell, Case Western Reserve University
 Teresa L. Conover, University of North Texas
 Ceil M. Pillsbury, U of Wisconsin-Milwaukee
 Cherie O'Neil, University of South Florida
 Mark F. Asman, Bowling Green State University
 Miklos Vasarhelyi, Rutgers University
 Craig E. Polhemus, AAA Executive Director

FACULTY DEVELOPMENT ADVISORY COMMITTEE

Charge: The Faculty Development Advisory Committee will serve in an advisory capacity to the AAA faculty development function. It is intended that this committee will provide the executive director and the director of faculty development a sounding board that could advise on new initiatives and suggest priorities. This committee will also provide input into reporting AAA faculty development efforts to the Sponsors' Task Force and the AAA membership. The advisory committee will have no direct responsibility for evaluating the director of faculty development, but could provide relevant input to such an evaluation to the executive director.

Co-Chairs: Richard E. Baker
 Department of Accountancy
 College of Business
 Northern Illinois University
 DeKalb, IL 60115-2854
 Phone: (815) 753-6205
 Fax: (815) 753-8515
 Email: rbaker@niu.edu

Julie H. Collins
 Accounting Faculty—CB3490
 Kenan-Flagler Business School
 University of North Carolina at Chapel Hill
 Chapel Hill, NC 27599-3490
 Phone: (919) 962-3207
 Fax: (919) 962-0054
 Email: julie_collins@unc.edu

Membership: Catherine M. Schrand, University of Pennsylvania
 Joseph E. Mori, San Jose State University
 Wilfred C. Uecker, Rice University
 Kevin D. Stocks, Brigham Young University
 John C. Gardner (AAPG), Oakland University
 Amy P. Hutton (RAC), Harvard University

FINANCE COMMITTEE

(Standing Committee of the Association)

Charge: To develop financial goals and strategies for the Association—specifically:

1. To review the three previous committees' reports and other important background material.
2. To evaluate additional or alternative ways to finance existing Association activities.
3. To plan financial strategies for Association initiatives and activities.
4. To work with the 1997–1998 President-Elect in preparing the 1998–1999 budget.
5. To monitor the investment of AAA funds in accordance with established Executive Committee policies and procedures.
6. To assist with implementation, in conjunction with appropriate headquarters' staff, a budgeting system for the association, including appropriate costing of products and services. The part of the project dealing with publications should be coordinated with the Publications Committee.
7. To review, as needed, association costs (such as employee benefits) and recommend changes, as appropriate.
8. To keep AAA members informed of finance committee activities by publishing finance committee minutes in *Accounting Education News*.

Chair: Karen L. Hooks
 (Florida Atlantic University)
 628 Riviera Isle
 Fort Lauderdale, FL 33301
 Phone: (954) 525-5878
 Fax: (954) 525-5879
 Email: karen_hooks@notes.pw.com

Membership: Anna C. Fowler, University of Texas at Austin
 Shirley Cheramy, Price Waterhouse Partner, retired
 William T. Wrege, Ball State University
 Brent C. Inman, Member of Sponsor Task Force, Coopers & Lybrand LLP
 Khursheed Omer, University of Houston–Downtown
 Michael A. Diamond, AAA President-Elect, University of Southern California
 Karen L. Hooks, Liaison, AAA Executive Committee, Florida Atlantic University

FINANCIAL ACCOUNTING STANDARDS COMMITTEE

Charge: To coordinate all Association activities with respect to financial accounting standard setting—specifically:

1. To evaluate selected discussion memoranda and exposure drafts related to financial accounting and reporting in the private sector as they are released by the FASB and other accounting standard-setting groups, and to respond to those groups in writing and by appearing at selected public hearings.
2. To be cognizant of emerging issues related to financial accounting and reporting in the private sector through materials issued by the Emerging Issues Task Force and other relevant sources with evaluation, where appropriate, of the significance and potential implications of such issues.
3. To meet with the FASB, normally on an annual basis.
4. To evaluate selected discussion memoranda and exposure drafts related to financial accounting and reporting as they are released by the IASC and to respond to the IASC in writing.
5. Recognize emerging international issues related to financial accounting, reporting and auditing; alert others inside the Association about their importance to determine the likely significance and potential implications of such issues. (From Globalization Initiatives Committee)
6. To explore the publication of selected responses by the committee in *Accounting Horizons* or other appropriate outlets.
7. To consider and promote ways to increase the quantity and quality of academic input to the standard-setting process.
8. To keep the AAA membership, through the Internet or other means, informed of:
 - a. Developments in Financial Accounting Standards.
 - b. Research opportunities relating to Financial Accounting Standards.

Chair: Thomas J. Linsmeier
 Department of Accountancy
 296 Commerce West Building
 University of Illinois at Urbana-Champaign
 1206 South Sixth Street
 Champaign, IL 61820
 Phone: (217) 244-6153
 Fax: (217) 244-0902

Membership: Mark H. Lang, University of North Carolina at Chapel Hill
 Ross G. Jennings, University of Texas at Austin
 D. Shores, University of Washington
 Bob Herz, Coopers & Lybrand LLP
 Greg Jonas, Arthur Andersen & Co. LLP
 James M. Wahlen, University of North Carolina
 James R. Boatsman, Arizona State University
 Kathy R. Petroni, Michigan State University
 G. Peter Wilson, Liaison, AAA Executive Committee, Boston College

FINANCIAL REPORTING ISSUES CONFERENCE COMMITTEE

Charge: To plan and hold the 1998 Financial Reporting Issues Conference in accordance with established AAA policies—specifically:

1. To review the three previous committees' reports and other important background material.
2. To seek the advice of appropriate Association committees on the content and structure of the 1998 conference.
3. To arrange to have the conference conducted and administered.
4. To report on the results and effectiveness of the conference and to recommend any changes to the Executive Committee.

Chair: Katherine Schipper
 Graduate School of Business
 University of Chicago
 1101 East 58th Street
 Chicago, IL 60637-1561
 Phone: (312) 702-7281
 Fax: (312) 702-0458
 Email: heather.daniel@gsb.uchicago.edu

Membership: Jim Leisenring, FASB
 Todd Johnson, FASB
 Greg Jonas, Arthur Andersen & Co. LLP
 James M. Wahlen, University of North Carolina at Chapel Hill
 Robert M. Bushman, RAC Liaison, University of Chicago
 G. Peter Wilson, Liaison, AAA Executive Committee, Boston College

GLOBALIZATION INITIATIVES COMMITTEE

Charge:

1. To review the previous committee's report and other important background material.
2. To work with the Executive Committee, the International Accounting Section, and others within and outside the Association, as appropriate, to:
 - a. Keep the AAA Executive Committee apprised of all international activities involving Association members.
 - b. Recommend Executive Committee involvement in international activities.
 - c. Develop a plan to facilitate international faculty interchange among countries, focused directly on identifying and publicizing opportunities.
 - d. Recommend actions to accelerate the globalization of the Association.
3. To contribute ideas to headquarters' staff involved in faculty program development that represent the interests of international members.
4. To make recommendations about how the Globalization Initiative Committee, the AAA Executive Committee and the International Sections should interface and interact.
5. To keep AAA members, through the use of the Internet or other means, informed of:
 - a. Globalization issues about which they should be aware.
 - b. Research opportunities related to global issues.

Co-Chairs: Joseph J. Schultz, Jr. College of Business Administration Arizona State University Tempe, AZ 85287-3606 Phone: (602) 965-7197 Fax: (602) 965-8392 Email: icjjs@asuvm.inre.asu.edu	Carol A. Frost Accounting Faculty Olin School of Business/1133 Washington University One Brookings Drive St. Louis, MO 63130-4899 Phone: (314) 935-6336
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Membership: Walter F. O'Connor, Fordham University
 Buck K. W. Pei, Arizona State University
 Kenneth A. Merchant, University of Southern California
 Edward P. Swanson, Texas A&M University
 Sidney J. Gray, University of Warwick
 Chen-en Ko, National Taiwan University
 C. S. Agnes Cheng, University of Houston
 Ray F. Carroll, Dalhousie University
 Joseph J. Schultz, Jr., Liaison, AAA Executive Committee, Arizona State University

GOVERNANCE COMMITTEE

Charge: To evaluate whether current governance procedures provide for appropriate member participation and to propose By-Laws changes and/or procedures, as appropriate—specifically:

1. To identify concerns of members about the AAA governance process.
2. To consider recommendations made by last year's Governance Committee and the AAA Executive Committee to see if they satisfy the governance concerns felt by AAA members.
3. If needed, to prepare recommendations for governance By-Laws changes.

Co-Chairs: Mary S. Doucet Department of Accounting and Management Information Systems College of Business Bowling Green State University Bowling Green, OH 43403-0262 Phone: (419) 372-8046 Fax: (419) 372-2875 Email: mdoucet@cba.bgsu.edu	Andrew D. Bailey, Jr. Department of Accountancy College of Commerce and Business Administration University of Illinois at Urbana-Champaign 1206 South Sixth Street Champaign, IL 61820 Phone: (217) 333-2451 Fax: (217) 244-0902
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Membership: Seleshi Sisaye, Duquesne University
 Carl S. Warren, University of Georgia
 Doyle Z. Williams, University of Arkansas
 E. Kent St. Pierre, University of Delaware
 Ellen L. Sweatt, DeKalb College—North Campus
 William L. Felix, Jr., University of Arizona
 Daniel L. Jensen, Ohio State University
 Michael A. Diamond, Liaison, AAA Executive Committee, University of Southern California

INNOVATION IN ACCOUNTING EDUCATION AWARD COMMITTEE

Charge:

1. To review the three previous committees' reports and other important background material.
2. To select the recipient(s) of the Innovation in Accounting Education Award, using the criteria approved by the Executive Committee.
3. To summarize, describe and include on the Internet, projects or innovations nominated for the award.
4. To consider the criteria for the award and recommend changes, as appropriate.

Chair: Paul J. Herz
 Accounting Faculty
 Department of Business and Accounting
 Western State College of Colorado
 Gunnison, CO 81231-7042
 Phone: (970) 943-2299
 Fax: (970) 943-7042

Membership: Shirley Dennis-Escoffier, University of Miami
 Vicky Arnold, University of Massachusetts Dartmouth
 Don W. Finn, Texas Tech University
 Robert H. Sanborn, University of Richmond
 Mary Alice Seville, Oregon State University
 Michael Wilk, Ernst & Young LLP
 James D. Stice, AEAC Liaison, Brigham Young University
 Richard E. Baker, Liaison, AAA Executive Committee, Northern Illinois University

MEMBERSHIP SERVICES AND SUBSCRIPTIONS COMMITTEE

Charge: To work with the Association staff and other AAA committees to define and enhance the benefits of membership—specifically:

1. To review the three previous committees' reports and other important background material.
2. To exchange information with the Committee to Promote Interaction Between Two-Year College Faculty and Faculty at Other Institutions.
3. To work with appropriate headquarters' staff in upgrading the Association's database of accounting educators, including the potential use of the databases contained in the *Accounting Faculty Directory* by James R. Hasselback and published by Prentice Hall, and in the database for two-year schools compiled by Joe Rhile.
4. To make specific recommendations for serving various subsets of members and for attracting potential nonmembers in high population groups—including:
 - a. Analyzing response patterns of recent surveys by various categories with the goal of tailoring program content or services to specific subsets of members and sharing it with appropriate others in the Association. For example:
 1. Identify characteristics of members commonly attending various meetings (e.g., Regional, national) and their preferences for program content at such meetings.
 2. Identify faculty at various types of accounting programs and determine their preference for Association services.
 - b. Using the results of the above analysis, previous committees' reports, the matrix of needs for faculty development, and studies by headquarters' personnel, establish likely interests of nonmembers in high population groups.
5. Based on member preferences, to contribute to instructional initiatives undertaken by headquarters' staff involved in faculty and program development, the AEAC and RAC, the regions and the sections.
6. Working with the AAA Executive Director, Craig Polhemus, correspond with all nonrenewing members to determine:
 - a. Why they didn't rejoin; and
 - b. What actions the AAA can take to solve commonly perceived needs and problems.
7. Thinking broadly, to identify potential new services the AAA could offer to members.

Chair: Anita S. Hollander
 School of Accounting
 College of Business Administration
 University of Tulsa
 600 South College Avenue
 Tulsa, OK 74104-3189
 Phone: (918) 631-3083
 Fax: (918) 631-2164
 Email: hollandeas@centum.utulsa.edu

Membership: Judyth A. Swingen, Gulf Coast University
 Peggy A. Hite, Indiana University
 Donald E. Wygal, Rider University
 James R. Hasselback, Florida State University
 James R. Emore, University of Akron
 Jeannie D. Johnson, Middle Tennessee State University
 Michele Lebas, HEC (France)
 Charles J. Pineno, Clarion University
 Philip H. Siegel, Monmouth University
 G. Peter Wilson, Liaison, AAA Executive Committee, Boston College

MINORITY FACULTY DEVELOPMENT COMMITTEE

Charge: To coordinate Association activities with respect to minority recruitment and development—specifically:

1. To identify issues of broad concern to minority faculty members and suggest ways the Association can help address these issues.
2. To explore ways in which potential minority candidates can be encouraged to apply to accounting programs and pursue professional careers in accounting education, including liaison with the KPMG Ph.D. project, NABA, INROADS and other groups interested in minority issues, and suggest ways the AAA can assist or work with them or can benefit from their work.
3. To recommend specific steps to the Executive Committee by February 28, 1998.

Chair: Jenice J. Prather
 School of Accountancy
 College of Business and Public Administration
 University of Missouri—Columbia
 321 Middlebush Hall
 Columbia, MO 65211
 Phone: (573) 882-3671
 Fax: (573) 882-2432
 Email: prather@bpa.missouri.edu

Membership: Viceola Sykes, Alabama State University
 Barron H. Harvey, Howard University
 Bernard Milano, KPMG Peat Marwick
 Allen G. Schick, Morgan State University
 Sandra W. Shelton, DePaul University
 W. Darrell Walden, University of Richmond
 Ronald L. Campbell, North Carolina A&T University
 Karen V. Pincus, Liaison, AAA Executive Committee, University of Arkansas

NEW FACULTY CONSORTIUM COMMITTEE

Charge: To plan and hold the 1998 New Faculty Consortium in accordance with established AAA policies—specifically:

1. To review the three previous committees' reports and other important background material.
2. To arrange to have the consortium conducted and administered.
3. To report on the results and effectiveness of the consortium and to recommend any changes to the Executive Committee by February 28, 1998.

Chair: Donna R. Philbrick
 Accounting Faculty
 School of Business Administration
 Portland State University
 637 SW Harrison, Room 560
 Portland, OR 97207-0751
 Phone: (503) 725-3725
 Fax: (503) 725-5850
 Email: donnap@sba.pdx.edu

Membership: S. Jane Kennedy, University of Washington
 Carolyn M. Callahan, University of Notre Dame
 Dennis Reigle, Arthur Andersen & Co. LLP
 Karl E. Hackenbrack, University of Florida
 Ella Mae Matsumura, AEAC Liaison, University of Wisconsin—Madison
 Douglas L. Shackelford, RAC Liaison, University of North Carolina at Chapel Hill
 Julie H. Collins, Liaison, AAA Executive Committee, University of North Carolina at Chapel Hill

NOMINATIONS COMMITTEE
(Standing Committee of the Association)

Charge: To select a list of nominees to AAA offices for election by the membership in August 1998 and carry out other duties specified in the By-Laws and Policy and Procedures Manual.

Chair: Jerry J. Weygandt
Department of Accounting and Information Systems
School of Business
University of Wisconsin-Madison
975 University Avenue
Madison, WI 53706-1323
Phone: (608) 262-1891
Fax: (608) 263-0477
Email: jweygandt@bus.wisc.edu

Membership: Robert J. Capettini, San Diego State University
Terry D. Warfield, University of Wisconsin
Susan F. Haka, Michigan State University
Mary S. Stone, University of Alabama
Katherine Schipper, University of Chicago
Joseph J. Schultz, Jr., Liaison, AAA Executive Committee, Arizona State University

NON-TRADITIONAL MEMBER COMMITTEE

Charge: To determine the role, dues structure and services that should be offered to student and retired members of the AAA by:

1. Reviewing the current criteria and determining appropriate criteria and dues for lifetime membership status in the AAA.
2. Determining appropriate AAA services, dues and Annual Meeting costs for retired members.
3. Determining meaningful roles for retired AAA membership to play in the AAA.
4. Reviewing the dues structure, Annual Meeting costs, and services offered to student members, and suggesting appropriate changes if any.

Chair: Anthony T. Krzystofik
Department of Accounting and Information Systems
School of Management
University of Massachusetts
Amherst, MA 01003-4915
Phone: (413) 545-5580
Fax: (413) 545-3858

Membership: Ephraim D. Dworetzky, Long Island University, Emeritus
Norton M. Bedford, University of Illinois, Emeritus
Dana A. Forgione, University of Baltimore
Barbara Chiappetta, Nassau Community College
G. Peter Wilson, Liaison, AAA Executive Committee, Boston College

NOTABLE CONTRIBUTIONS TO ACCOUNTING LITERATURE AWARD SCREENING COMMITTEE

Charge: To identify works of exceptional merit from published accounting books and articles that meet the guidelines for the "Notable Contributions" award, as established by the Executive Committee.

Chair: Robert H. Trezevant
Accounting Faculty
School of Accounting
University of Southern California
Los Angeles, CA 90089-1421
Phone: (213) 740-5013
Fax: (213) 747-2815
Email: trezeva@usc.edu

Membership: Martha L. Wartick, University of Missouri–St. Louis
Andrew D. Cuccia, University of Illinois at Urbana–Champaign
John W. Dickhaut, University of Minnesota
James A. Ohlson, Columbia University
Susan Ayers, University of Tennessee
William F. Bowlin, University of Northern Iowa
Eugene G. Chewning, Jr., University of South Carolina
Mark A. Covalesski, University of Wisconsin–Madison
Somnath Das, University of Illinois at Chicago
Jon S. Davis, University of Illinois at Urbana–Champaign
Susan Leone, Institute of Internal Auditors
Ilia D. Dichev, University of Michigan
Philip D. Drake, Southern Methodist University
John W. Eichenseher, University of Wisconsin–Madison
George Foster, Stanford University
Helen Gemon, University of Oregon
Dipankar Ghosh, University of Oklahoma
Froystein Gjesdal, Norwegian School of Economics & Business Administration
Lynford E. Graham, Rutgers University
B. Charlene Henderson, Louisiana State University
Chris E. Hogan, Vanderbilt University
Lisa L. Koonce, University of Texas at Austin
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Steve G. Sutton, Bryant College
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Susanne Valdez, U.S. General Accounting Office
Douglas E. Ziegenfuss, Old Dominion University
Julie H. Collins, Liaison, AAA Executive Committee, University of North Carolina at Chapel Hill

NOTABLE CONTRIBUTIONS TO ACCOUNTING LITERATURE AWARD SELECTION COMMITTEE

Charge: To select the recipient(s) of the award from those books and articles identified by the Screening Committee as potentially notable contributions to accounting literature.

Chair: Jamie Pratt
Department of Accounting and Information Systems
School of Business
Indiana University
10th and Fee Lane
Bloomington, IN 47405
Phone: (812) 855-2657
Fax: (812) 855-8679
Email: jpratt@indiana.edu

Membership: A. Rashad Abdel-khalik, University of Florida
Barry E. Cushing, University of Utah
Sandra S. Kramer, University of Florida
G. Lee Willinger, University of Oklahoma
Michael L. Davis, Lehigh University
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William G. Shenkir, University of Virginia
Mary S. Stone, University of Alabama
Richard H. Tabor, Auburn University
Stephen G. Ryan, RAC Liaison, New York University
Julie H. Collins, Liaison, AAA Executive Committee, University of North Carolina at Chapel Hill

OUTSTANDING ACCOUNTING EDUCATOR AWARD COMMITTEE

Charge: To select one or (at most) two recipient(s) of the Outstanding Accounting Educator Award, using criteria approved by the Executive Committee.

Chair: Michael W. Maher
Accounting Faculty
Graduate School of Management
University of California, Davis
AOB4, Shields Avenue
Davis, CA 95616-8609
Phone: (916) 752-7034
Fax: (916) 752-2924
Email: mwmaher@ucdavis.edu

Membership: N. Allen Ford, University of Kansas
Penelope S. Greenberg, Widener University
Robert Glen Berryman, University of Minnesota, Emeritus
Hadley P. Schaefer, University of Florida
W. Bruce Johnson, University of Iowa
Grace Pownall, AEAC Liaison, Emory University
Richard E. Baker, Liaison, AAA Executive Committee, Northern Illinois University

PROFESSIONAL EXAMINATIONS COMMITTEE

Charge:

1. To conduct activities as appropriate to assist communication and interaction between the membership of the Association and the various professional accounting examination bodies.
2. To monitor activities of these professional bodies.
3. To evaluate the implications of their respective examinations for accounting education.
4. To work to ensure that changes made to professional exams are consistent with the needs and research of AAA members.
5. To work closely with the AICPA as they make major changes to the CPA Exam.

Chair: William A. Collins
 Department of Accounting
 Bryan School of Business and Economics
 University of North Carolina at Greensboro
 1000 Spring Garden Street
 Greensboro, NC 27412-5001
 Phone: (910) 334-5647
 Fax: (910) 334-5580
 Email: collinsw@uncg.edu

Membership: Philip J. Harmelink, University of New Orleans
 Gail B. Wright, Bryant College
 Jack C. Gray, Michigan State University
 Bea Sanders, AICPA
 John H. Engstrom, Northern Illinois University
 Priscilla S. Payne, Institute of CMA
 James E. Burton, Middle Tennessee State University
 Jan R. Williams, University of Tennessee
 Pete Orsburn, ILA
 Michael A. Diamond, AAA Executive Committee, University of Southern California

PROFESSIONALISM AND ETHICS COMMITTEE

Charge: To foster ethical conduct among members and ethics education and scholarship in the accounting profession—specifically:

1. To review the three previous committees' reports and other important background material.
2. To oversee completion of the monograph on ethical issues in accounting.
3. To explore avenues for fostering ethics education and scholarship over time and, where appropriate, to make recommendations to the Executive Committee. The options to be explored will include a possible revision of the casebook produced by the committee in prior years.
4. To propose and, if approved, organize and conduct CPE and concurrent sessions at the regional and national meetings, as warranted.
5. To act as a resource on ethics in the accounting profession to the Executive Committee, regions, sections, other committees and other groups.
6. To work with the Electronic Materials Dissemination Committee to include teaching materials (cases, teaching notes, syllabi, etc.) related to ethics on the Internet.

Chair: C. Richard Baker
 Department of Accounting and Finance
 University of Massachusetts Dartmouth
 North Dartmouth, MA 02747
 Phone: (508) 999-9243
 Fax: (508) 999-8776
 Email: rbaker@umassd.edu

Membership: Cindy L. Moeckel, Arizona State University
 Jeffery R. Cohen, Boston College
 James C. Gaa, University of Alberta
 Laurie W. Pant, Suffolk University
 Robert G. Ruland, Ruland Manufacturing
 Michael K. Shaub, Hillsdale College
 Steve G. Sutton, Bryant College
 Robert J. Sack, Liaison, AAA Executive Committee, University of Virginia

PROFESSIONAL RELATIONS COMMITTEE

Charge: To build relationships with key non-academic stakeholders by:

1. Identifying the 50 or so major recruiters (corporate, practice accounting, etc.) and stakeholders of the AAA.
2. Identifying the key person(s) in each of these organizations with whom the AAA should communicate.
3. Determining how to communicate with them (annual conference where a representative would be involved, periodic newsletters, etc.) to:
 - a. Inform them of current AAA activities,
 - b. Better network with these critical stakeholders, and
 - c. To seek input about the priorities and ideas for AAA activities.
4. Determining a long-run structural arrangement by which the AAA can maintain key relationships with the stakeholders and increase the number of such stakeholders.

Chair: Jan R. Williams
 Department of Accounting and Business Law
 School of Business Administration
 University of Tennessee
 916 Volunteer Boulevard
 Knoxville, TN 37996-0560
 Phone: (423) 974-1746
 Fax: (423) 974-4631
 Email: jwilli13@utk.edu

Membership: Tom Powell, The Powell Group
 Sam Vitkoski, BDO Seidman
 Zoe-Vonna Palmrose, University of Southern California
 Lawrence Revsine, Northwestern University
 Ronald J. Patten, DePaul University
 Bernie Milano, KPMG Peat Marwick
 David Landsittel, Arthur Anderdon & Co.
 Brent C. Inman, Liaison, AAA Executive Committee, Coopers & Lybrand LLP

PROGRAM ADVISORY COMMITTEE

Charge: To assist the President and the Executive Director in developing the technical program for the 1998 Annual Meeting in New Orleans.

Chair: Silvia A. Madeo
 Accounting Area
 School of Business Administration
 University of Missouri-St. Louis
 8001 Natural Bridge Road
 St. Louis, MO 63121-4499
 Phone: (314) 516-6264
 Fax: (314) 516-6420
 Email: smadeo@umslvma.umsl.edu

Membership: Katherine Schipper, University of Chicago (Research Sessions)
 Jan R. Williams, University of Tennessee (Practice Issue Sessions)
 Melvin C. O'Connor, Michigan State University (Teaching Related Sessions)
 Russell M. Barefield, University of Georgia (Administrators of Accounting Programs Group)
 Vicky Arnold, University of Massachusetts Dartmouth (Accounting, Behavior and Organizations)
 Susan E. Anderson, University of North Carolina at Greensboro (American Taxation Association)
 Miklos A. Vasarhelyi, Rutgers University (Artificial Intelligence/Emerging Technologies)

Joseph V. Carcello, University of Tennessee (Auditing)
 Mark H. Lang, University of North Carolina at Chapel Hill (Financial Accounting and Reporting)
 Karen A. Fortin, University of Baltimore (Gender Issues in Accounting)
 Donald R. Deis, Jr., Louisiana State University (Government and Nonprofit)
 James E. Hunton, University of South Florida (Information Systems)
 Shahrokh M. Saudagaran, Santa Clara University (International Accounting)
 Andrew E. Spero, Washington University (Management Accounting)
 Lawrence P. Kalbers, John Carroll University (Public Interest)
 Robin W. Roberts, Iowa State University (Teaching and Curriculum)
 Ellen L. Sweatt, DeKalb College (Two-Year College)
 W. Steve Albrecht, Liaison, AAA Executive Committee, Brigham Young University

PUBLICATIONS COMMITTEE **(Standing Committee of the Association)**

Charge: To monitor and coordinate all aspects of the Association's publications program—specifically:

1. To report periodically to the President and Executive Committee on all matters of concern in the field of publications—including:
 - a. Appropriate library subscription rates.
 - b. Other matters as appropriate.
2. To recommend candidates for editor or editor-elect positions as appropriate.
3. To evaluate and monitor trends in electronic publishing in order to protect subscription revenues of the Association.
4. To determine whether one or more AAA publication should be published electronically and, if so, how subscription revenues can be sustained.
5. To recommend changes in AAA publications to the Executive Committee as deemed desirable.

Chair: Robert J. Sack
 Department of Accounting, Box 6550
 Darden Graduate School of Business Administration
 University of Virginia
 Arlington Boulevard
 Charlottesville, VA 22906-6550
 Phone: (804) 924-4814
 Fax: (804) 924-4826
 Email: sackr@darden.gbus.virginia.edu

Membership: Sandra Vera-Munoz, University of Notre Dame
 Jean C. Wyer, Coopers & Lybrand
 Andrew W. Alford, University of Pennsylvania
 Linda S. McDaniel, University of North Carolina at Chapel Hill
 Gary John Previts, Case Western Reserve University
 Philip M. J. Reckers, Arizona State University
 Robert J. Sack, Liaison, AAA Executive Committee, University of Virginia

REGION AND SECTION MEETINGS REVIEW COMMITTEE

Charge:

1. To review the format of the regional and section midyear meetings and suggest ways, if any, in which regions and sections can work together so that their meetings compliment, rather than compete with, each other. Your review should examine all aspects of the region and section meetings but should pay special attention to the following issues:
 - a. What the role of each meeting should be.
 - b. How attendance at each of the meetings can be increased so that a broader membership may be served.
 - c. Pricing of the meetings and their events.
2. To consider meeting arrangements sections and regions have with the AAA and others, and recommend a policy that best serves the interests of all parties involved.

3. To communicate to the Governance Committee any changes needed in the governance structure of the AAA to better coordinate the activities of sections and regions.
4. Present a written report to your executive committee liaison by March 15, 1998.

Chair: Jane F. Mutchler
 Department of Accounting
 Smeal College of Business Administration
 Pennsylvania State University
 University Park, PA 16802-1912
 Phone: (814) 863-3569
 Fax: (814) 863-8393
 Email: jfm5@psu.edu

Membership Susan S. Lightle, Wright State University
 Paula B. Thomas, Middle Tennessee State University
 Edmund Outslay, Michigan State University
 Florence C. Sharp, Ohio University
 Paul H. Mihalek, University of Hartford
 Srinivasan C. Ragothaman, University of South Dakota
 Michael A. Robinson, Baylor University
 Karen V. Pincus, Liaison, AAA Executive Committee, University of Arkansas

RESEARCH ADVISORY COMMITTEE

Charge: To serve as the coordinating committee for Association activities that involve accounting research—specifically:

1. To monitor the accounting research activities of other accounting associations (e.g., AICPA, FEI, IIA and IMA).
2. To advise the Director of Research in the development and administration of the Association's programs in accounting research, including contributing to effective initiatives undertaken by headquarters' staff involved in faculty development, the regions and the sections.
3. To suggest ways to encourage research in accounting, including research related to discovery, integration, application and teaching.
4. To provide effective research liaison with regions and sections.
5. To coordinate the work of research-designated committees, such as the Competitive Manuscript Committee, the Doctoral Consortium Committee and the Financial Reporting Issues Conference Committee.
6. To work with AEAC to coordinate and implement the Association's faculty program development activity—including:
 - a. Coordination of faculty and program development among the Accounting Education Advisory Committee, the Research Advisory Committee, the Electronic Materials and Dissemination Committee, sponsoring organizations, headquarters' personnel and the new director of faculty development.
 - b. Evaluation of alternatives to improve the efficiency and effectiveness of processes used in implementing faculty and program development.
 - c. Proposal of a detailed budget, in conjunction with the executive director and the director of faculty development, to the Executive Committee and allocate, where authorized, funds specifically designated for this function, including any grants that might be a part of the program.
7. To work with the AEAC, director of faculty development Regions, Sections and the Program Advisory Committee to suggest and sponsor research-related CPE sessions at national, Regional and Section meetings.

Chair: Julie H. Collins
 Accounting Faculty—CB3490
 Kenan-Flagler Business School
 University of North Carolina at Chapel Hill
 Chapel Hill, NC 27599-3490
 Phone: (919) 962-3207
 Fax: (919) 962-0054
 Email: julie_collins@unc.edu

Membership: Amy P. Hutton, Harvard University
 Maureen F. McNichols, Stanford University
 William R. Kinney, Jr., University of Texas at Austin
 Kathy R. Petroni, Michigan State University
 Linda S. Bamber, University of Georgia
 Douglas A. Shackelford, University of North Carolina at Chapel Hill
 Stephen G. Ryan, New York University
 Robert M. Bushman, University of Chicago
 Julie H. Collins, Liaison, AAA Executive Committee, University of North Carolina at Chapel Hill

SECURITIES AND EXCHANGE COMMISSION LIAISON COMMITTEE

Charge: To conduct activities as appropriate to assist communication and interaction between the SEC and the membership of the Association—specifically:

1. To prepare and transmit a response to the staff of the Securities and Exchange Commission on selected proposals soliciting views from the public concerning auditing and financial accounting and reporting.
2. To make recommendations and to develop program(s) that will assist the teaching of, and conducting research on, topics related to the SEC and its activities.
3. To make recommendations to the Executive Committee for activities that will enhance the quality and quantity of interactions between the SEC and the Association.
4. To keep AAA members, through the use of the Internet or other means, informed of:
 - a. Developments of the SEC.
 - b. Research opportunities related to SEC work or issues with which they are dealing.
5. To consult with selected regional program chairs early in the academic year to allow for presentation by the SEC Academic Fellow at selected regional meetings, including filing a status report with the Executive Committee by October 31, 1997, February 28, 1998, and July 15, 1998.

Chair: Robert C. Lipe
 School of Accounting
 Michael F. Price College of Business
 University of Oklahoma
 307 West Brooks, Room 200
 Norman, OK 73019-0450
 Phone: (405) 325-2401
 Fax: (405) 325-7348
 Email: rlipe@cbafac.cba.uoknor.edu

Membership: Robert K. Zimmer, University of Denver
 Jack C. Robertson, University of Texas at Austin
 Thomas R. Weirich, Central Michigan University
 Jere R. Francis, University of Missouri
 H. Fred Mittelstaedt, University of Notre Dame
 Joseph J. Schultz, Jr., Liaison, AAA Executive Committee, Arizona State University

TECHNOLOGY COORDINATION COMMITTEE

Charge: The Technology Coordination Committee has two charges for the coming year. The first is a strategic component which is to: develop a framework and policies to facilitate the planning, coordination, and control of electronic dissemination for the American Accounting Association.

The second is a tactical component which is to: identify and prioritize five or six electronic dissemination services that can be delivered to members during the coming year. Ensure that the design, development and delivery of these services occurs as quickly as possible and is based on coordinated decisions that weigh concerns related to faculty development, the Electronic Dissemination Committee, the sections, regions and groups, the administrative functions in Sarasota, the Publications Committee, the Rutgers Accounting Website coordinator, and the AAA's strategic plan.

Chair: G. Peter Wilson
 Department of Accounting
 Carroll School of Management
 Boston College
 140 Commonwealth Avenue
 Chestnut Hill, MA 02167-3808
 Phone: (617) 552-1963
 Fax: (617) 552-2097
 Email: wilsongp@bc.edu

Membership: Robert J. Sack, University of Virginia
 Tracey E. Sutherland, AAA Director of Faculty Development
 Karen V. Pincus, University of Arkansas
 Craig E. Polhemus, AAA Executive Director
 Miklos A. Vasarhelyi, Rutgers University
 Clinton E. (Skip) White, Jr., University of Delaware

TRUEBLOOD SEMINARS COMMITTEE

Charge: To assist Deloitte & Touche in conducting the Trueblood Seminars—specifically:

1. In conjunction with Deloitte & Touche, to arrange to have the seminars conducted and administered.
2. To report on the results and effectiveness of the seminars and to recommend changes by July 15, 1998.

Chair: Michael L. Feters
 Division of Accounting and Law
 School of Management
 Babson College
 Babson Park, MA 02157-0901
 Phone: (617) 239-4405
 Fax: (617) 239-5230
 Email: feters@babson.edu

Membership: Mark Chain, Deloitte & Touche
 Nancy R. Baldiga, College of the Holy Cross
 Pierre L. Titard, Mississippi State University
 J. Scott Whisenant, Georgetown University
 Richard E. Baker, Liaison, AAA Executive Committee, Northern Illinois University

JANUARY 1998 PLACEMENT ADS

The deadline for information to be included in the "Placement Ads" section is two months prior to the date of publication. The Review is published on the first day of January, April, July and October. Placement advertising and replies should be sent to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399, ATTENTION: ADVERTISING DEPT. All replies to box numbers should be on separate sheets to facilitate forwarding.

- 101 THE UNIVERSITY OF MARYLAND AT COLLEGE PARK invites applications for faculty positions at the Assistant rank (both entry level as well as mid-level) in auditing and at the Associate rank in financial accounting, to start in August 1998. Applicants must have a doctoral degree at the time of joining the faculty. A proven research record (including at the Assistant entry level) commensurate with the level of the appointment is required of all candidates. Please send a resume to Professor Oliver Kim, College of Business and Management, University of Maryland at College Park, College Park, MD 20742. Interviewing will commence in the early fall of 1997. The University of Maryland is an Equal Opportunity/Affirmative Action Employer. Women and minorities are especially encouraged to apply.
- 102 UNIVERSITY OF UTAH School of Accounting expects to have positions for two new faculty members, pending funding, beginning in the 1998-99 academic year. Applicants should possess a Ph.D., D.B.A. or be close to completion. All applicants are expected to have a commitment to quality research and teaching excellence. Rank will be considered subject to applicant's qualifications and school needs. Salaries, research support and teaching loads are competitive and fringe benefits are excellent. The School of Accounting and the David Eccles School of Business are both accredited at the undergraduate and graduate levels by the AACSB. Bachelor's, M.B.A., M.Pr.A. and Ph.D. programs are offered. The application deadline is February 1, 1998 or until the position is filled. Please send application including proposal or working paper, *vita* and three letters of reference to Dr. Martha M. Eining, Director, School of Accounting, David Eccles School of Business, University of Utah, 1645 E. Campus Center Dr., Rm. 101, Salt Lake City, UT 84112-0750. The University of Utah is an Equal Opportunity/Affirmative Action Employer and encourages nominations and applications from women and minorities and provides reasonable accommodations to the known disabilities of employees.
- 103 UNIVERSITY OF WATERLOO School of Accountancy invites applications for tenure-track positions at the Assistant Professor or Associate Professor rank starting Fall 1998. A position is available in auditing, finance, managerial accounting and taxation. Candidates must possess a doctorate degree or be close to completion. Also required are an interest in and ability to publish high-quality research and a commitment to teaching excellence. In accordance with Canadian immigration requirements, priority consideration will be given to Canadian citizens and permanent residents. These appointments are subject to the availability of funds. The University of Waterloo encourages applications from all qualified individuals, including women, members of visible minorities, native peoples and persons with disabilities. Please send *vita*, three letters of reference and samples of research to Dr. J. Efrim Boritz, School of Accountancy, University of Waterloo, Waterloo Ontario N2L 3G1, CANADA.
- 104 UNIVERSITY OF MICHIGAN Business School has at least one entry-level tenure-track position available in accounting starting in the 1998-99 academic year. Applications should include a research paper based on the candidate's dissertation, any other published or unpublished research, evidence of teaching experience (if any), and a *curriculum vitae* that includes three references. All areas of accounting will be considered with the exception of auditing and management information systems. The University of Michigan offers competitive salary and fringe benefits and is a Nondiscriminatory/Affirmative Action Employer. Applications should be sent to Professor Douglas J. Skinner, Accounting Department, University of Michigan Business School, 701 Tappan Street, Ann Arbor, MI 48109-1234.

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A QUARTERLY JOURNAL OF THE
AMERICAN ACCOUNTING ASSOCIATION

AMERICAN ACCOUNTING ASSOCIATION

The members of the 1997-98 Executive Committee of the Association are as follows:

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Director of Publications	Robert J. Sack, University of Virginia
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The full-time Executive Director of the Association is Craig E. Polhemus.

The American Accounting Association was founded in 1916 as the American Association of University Instructors in Accounting. Its present name was adopted in 1936. The Association is a voluntary organization of persons interested in accounting education, research and practice. Full membership entitles one to receive *Accounting Education News*, a selection of one, two or all three of the Association-wide journals (*The Accounting Review*, *Accounting Horizons* and *Issues in Accounting Education*) and the opportunity to purchase Association publications at a discount.

Membership in the Association is available at the following annual rates:

Full membership:

The membership dues are based on the selection of one, two or all three of the following Association-wide journals: *The Accounting Review*, *Accounting Horizons* and *Issues in Accounting Education*. (This does not include Section journals.)

Select one Association-wide journal	U.S. \$85.00
Select two Association-wide journals	U.S. \$95.00
All three Association-wide journals	U.S. \$100.00

Associate membership for students residing in the United States and Canada:

Select one Association-wide journal	U.S. \$12.00
Select two Association-wide journals	U.S. \$22.00
All three Association-wide journals	U.S. \$27.00

In addition, full members may belong to one or more Sections: Accounting, Behavior and Organizations; Administrators of Accounting Programs Group; American Taxation Association; Artificial Intelligence/Emerging Technologies; Auditing; Financial Accounting and Reporting; Gender Issues in Accounting; Government and Nonprofit; Information Systems; International Accounting; Management Accounting; Public Interest; Teaching and Curriculum; and Two-Year College. Each Section assess its own annual dues which are collected by the Association.

Subscriptions to *The Accounting Review* are available at the annual rate of U.S. \$110.00, effective January 1, 1998.

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Editorial correspondence and all manuscripts should be sent to Professor Gerald L. Salamon, Editor, *The Accounting Review*, School of Business, Indiana University, Bloomington, IN 47405.

The submission fee of \$75.00 for members of the AAA or \$100.00 for nonmembers must accompany manuscripts when submitted. Books for review should be sent to Professor Thomas H. Williams, Accounting Area, McIntire School, University of Virginia, Charlottesville, VA 22903-2493. Request for reprint permission, subscriptions, advertisements and dues should be sent to American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399 • Telephone: (941) 921-7747 • Fax: (941) 923-4093 • Email: AAAhq@aol.com. Notice of change of address should be mailed at least eight weeks in advance to ensure undelayed receipt of *The Accounting Review*.

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Editor

Gerald L. Salamon

Associate Editors

Stanley Baiman

Mark W. Nelson

Mary E. Barth

Jamie H. Pratt

Dan S. Dhaliwal

Brett Trueman

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Editorial Staff of *The Accounting Review*
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Gerald L. Salamon, Indiana University

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Mary E. Barth, Stanford University
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Jamie H. Pratt, Indiana University
Brett Trueman, University of California at Berkeley

BOOK REVIEW EDITOR
Thomas H. Williams, University of Virginia

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Roland LaTulip
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Judy Cothorn
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Deferred Tax Accounting Under SFAS No. 109: An Empirical Investigation of its Incremental Value-Relevance Relative to APB No. 11

Benjamin C. Ayers
University of Georgia

ABSTRACT: This study investigates whether the net deferred tax liabilities disclosed under Statement of Financial Accounting Standards No. 109, *Accounting for Income Taxes* (SFAS No. 109) provides additional value-relevant information over the disclosure required by Accounting Principles Board Opinion No. 11, *Accounting for Income Taxes* (APB No. 11). Evidence suggests that SFAS No. 109 data represent value-relevant information above and beyond APB No. 11. Additionally, evidence indicates that the changes made by SFAS No. 109—the separate recognition of deferred tax assets, the creation of valuation allowances for deferred tax assets and the adjustment of deferred tax accounts for enacted tax rate changes—each provide value-relevant firm data. These results suggest that SFAS No. 109 increased the value-relevance of deferred tax amounts in financial statements.

Key Words: *Deferred tax liability, Interperiod tax allocation, FASB, Financial statement disclosures.*

Data Availability: *The data are available from public sources. A list of sample firms is available from the author.*

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I. INTRODUCTION

Statement of Financial Accounting Standards No. 109, *Accounting for Income Taxes* (FASB 1992) (SFAS No. 109) represents the culmination of a multi-year process in which the Financial Accounting Standards Board (FASB) reviewed and subsequently modified the requirements for accounting for income taxes. Effective for fiscal years beginning after December 15, 1992, SFAS No. 109 requires an "asset and liability" approach for the accounting for income taxes. That is, deferred income taxes are viewed as assets and liabilities of the firm, and deferred tax expense is determined by the current-year change in the firm's deferred tax liabilities and assets. Previously, Accounting Principles Board Opinion No. 11, *Accounting for Income Taxes* (APB 1967) (APB No. 11) required a "deferral" approach to accounting for income taxes.¹ The primary intent of the deferral approach was to match tax expense with corresponding revenues and expenses for the year in which the revenues and expenses were recognized in the financial statements. Unlike SFAS No. 109, APB No. 11 did not require firms to adjust deferred tax balances for subsequent events such as changes in tax rates or laws.

SFAS No. 109 requires firms to recognize (1) the taxes payable or refundable for the current year, and (2) deferred tax liabilities and assets for the future tax implications of transactions that have been recognized in the firm's financial statements or tax returns. In enacting SFAS No. 109, the FASB conjectured "that the asset and liability approach to accounting for income taxes is most consistent with the definitions in Statement of Financial Accounting Concepts No. 6, *Elements of Financial Statements* (SFAC No. 6), and with other parts of the conceptual framework." Additionally, the FASB theorized that "the asset and liability approach produces the most useful and understandable information and that it is no more complex than any other approach to accounting for income taxes." This study investigates whether SFAS No. 109 measures of net deferred tax liabilities provide incremental value-relevant information relative to the disclosures required by APB No. 11. I assume that incremental value-relevance exists if SFAS No. 109 deferred tax measures have significant coefficients in a regression of the market value of equity on balance sheet amounts that include APB No. 11 deferred tax amounts.

The question of whether SFAS No. 109 provides incremental value-relevant firm-specific information is of interest for at least two related reasons. First, the FASB is obligated to consider the costs and benefits of its standards. Deloitte & Touche (1992, 56) suggest that the cost of complying with SFAS No. 109 can be substantial compared to the costs of complying with APB No. 11. Consequently, *ex post* evidence that there is incremental value-relevance to SFAS No. 109 disclosures is pertinent to assessing the effectiveness of the standard-setting process.

Second, the objective of accounting policy decisions is to produce information that is *relevant* and *reliable* (FASB 1980, SFAC No. 2). This study documents whether SFAS No. 109 provides value-relevant, firm-specific information. In essence, I assess the relevance of SFAS No. 109 information assuming that such information is reliably measured.

To provide evidence on the value-relevance of SFAS No. 109 vs. APB No. 11 net deferred tax liabilities, I perform regression analysis on a sample of NYSE and AMEX

¹ SFAS No. 109 supersedes APB No. 11 and Statement of Financial Accounting Standards No. 96, *Accounting for Income Taxes* (FASB 1987) (SFAS No. 96). Initially, SFAS No. 96 was intended to replace APB No. 11, but adoption of SFAS No. 96 was never formally required. Though some firms chose to adopt SFAS No. 96 voluntarily, the majority of firms did not. This study focuses on the differences in accounting for income taxes as prescribed by SFAS No. 109 and APB No. 11.

firms that adopted SFAS No. 109 in 1992 or 1993.² Year-by-year cross-sectional regressions (Landsman 1986; Barth 1991) relate share prices to financial statement measures of assets, liabilities, net deferred tax liabilities, net pension liabilities and other post-retirement benefit obligations. This analysis decomposes the SFAS No. 109 net deferred tax liability into two components: (1) the APB No. 11 net deferred tax liability and (2) the cumulative effect of adopting SFAS No. 109.³ Results indicate that the SFAS No. 109 cumulative effect is value-relevant.

To investigate why the SFAS No. 109 net deferred tax liability has incremental value-relevance beyond the APB No. 11 liability, I perform additional analyses on the principal differences between SFAS No. 109 and APB No. 11. First, I test the value-relevance of the separate recognition of deferred tax assets and the creation of the deferred tax asset valuation allowance. Under SFAS No. 109, firms separately disclose deferred tax assets and deferred tax liabilities, and establish a valuation allowance to reduce deferred tax assets when the full amount is not expected to be realized. SFAS No. 109 requires firms to establish a valuation allowance unless full realization of the deferred tax asset is more likely than not to occur. In contrast, APB No. 11 does not require the separate disclosure of deferred tax assets and, because it uses a more conservative standard for recognition of deferred tax assets, it does not require the creation of valuation allowances. Results from cross-sectional regressions indicate that both the deferred tax assets and the valuation allowances recognized pursuant to SFAS No. 109 are value-relevant.

Second, I test the value-relevance of SFAS No. 109 adjustments for the effects of changes in enacted tax rates. In this analysis, I test the value-relevance of SFAS No. 109 adjustments for the tax rate increase enacted in the Revenue Reconciliation Act of 1993. Unlike SFAS No. 109, APB No. 11 does not require firms to adjust existing deferred tax balances to reflect current tax laws or rates. Results from cross-sectional regressions indicate that the SFAS No. 109 adjustments for the 1993 tax law change are reflected in firm value.

In summary, this study's evidence suggests that SFAS No. 109 provides value-relevant firm-specific information beyond APB No. 11. Additionally, this study provides insight into why SFAS No. 109 is more value-relevant than APB No. 11. Both SFAS No. 109 valuation allowances and SFAS No. 109 adjustments for tax law changes are associated with firm value. Thus, the two principal adjustments enacted with SFAS No. 109 provide information relevant to financial statement users.

The remainder of this paper is organized as follows. Section II develops the study's hypothesis, and section III discusses the sample selection process. Section IV describes the empirical methods employed and the results of these analyses. Section V discusses sensitivity tests. Section VI summarizes the contributions and conclusions of this research.

II. HYPOTHESIS DEVELOPMENT

Prior research has examined whether investors value deferred tax liabilities as firm liabilities. Evidence in Givoly and Hayn (1992) indicates that investors discount deferred tax liabilities in accordance with the timing and likelihood of their settlement. Tse and Holtzman (1995) suggest that investors view deferred taxes as liabilities, and that differences in the implications of deferred tax liabilities across industries (e.g., oil and gas firms vs. non-oil and gas firms) are reflected in the valuation of deferred tax liabilities. Thus,

² The comparison of APB No. 11 and SFAS No. 109 amounts is based on *net* deferred tax liabilities because, unlike SFAS No. 109, APB No. 11 did not require separate disclosure of deferred tax assets and liabilities.

³ Both the SFAS No. 109 and APB No. 11 amounts are derived from financial statement disclosures required by SFAS No. 109. SFAS No. 109 required firms to disclose the cumulative effect of adopting SFAS No. 109, but did not require the specification of the sources of this difference.

recent research suggests that deferred tax liabilities are value-relevant. However, these studies considered the value-relevance of deferred tax amounts as determined under APB No. 11. This study contributes to existing literature by examining the valuation implications of the accounting for income taxes as required by SFAS No. 109.

SFAS No. 109 shifted the accounting for income taxes to a balance sheet approach from APB No. 11's income statement approach. Prior research indicates that deferred tax liabilities determined under APB No. 11 are value-relevant, but there are arguments both for and against the incremental value-relevance of SFAS No. 109 disclosures. I consider both kinds of arguments in the following paragraphs. Pro-SFAS No. 109 arguments are discussed first.

SFAS No. 109 requires firms to measure deferred tax assets and liabilities at the tax rate expected to be applicable when existing deferred tax balances are settled, instead of the rate applicable during the year the amounts originated. Additionally, SFAS No. 109 requires firms to re-measure deferred tax assets and liabilities when enacted tax rates change. Previously, APB No. 11 required firms to measure deferred tax assets and liabilities using the tax law and tax rate applicable in the year the deferred tax asset or liability originated.⁴

SFAS No. 109's requirements have two effects. First, firms no longer estimate deferred tax balances using outdated historical tax laws or rates. Assuming current tax laws and rates are better indicators of a firm's tax liability upon settlement, SFAS No. 109 amounts should be more value-relevant than APB No. 11 amounts. Second, SFAS No. 109's requirements assure that upon partial settlement of a deferred tax item, no residuals associated with the partially settled item remain in the deferred account as a result of failing to account for tax law or rate changes. Because APB No. 11 did not require firms to estimate deferred tax items using current tax law and the expected tax rate upon settlement, deferred tax balances under APB No. 11 may contain residual amounts generated by partially settled deferred items. Because these residuals increase the noise associated with the APB No. 11 net deferred tax liability, one could expect SFAS No. 109 to provide a more value-relevant measure of deferred tax balances.⁵

Finally, SFAS No. 109 eases the requirements for recognizing deferred tax assets to a standard that is more consistent with SFAC No. 6 (FASB 1985) and presumably the market's definition of an asset. SFAC No. 6 defines "assets" as *probable* future economic benefits. In SFAC No. 6, the term "probable" refers to that "which can reasonably be expected or believed on the basis of available evidence or logic but is neither certain or proved."

⁴ There are at least two reasons why tax rates may differ at the time deferred tax balances are settled vs. their origination date. First, the firm's profitability level may increase (decrease) during the period between origination and settlement, which may cause deferred tax amounts to be subject to higher (lower) tax rates upon their settlement. Second, statutory tax rates can change and alter the tax rate structure applicable to deferred tax assets and liabilities at their settlement.

⁵ The following example illustrates how APB No. 11 leads to deferred tax residuals, while SFAS No. 109 does not. Company A has a difference in taxable income and pre-tax financial income in year 1 of \$1,000. Under APB No. 11 and SFAS No. 109, this difference is valued at the year 1 tax rate of 34 percent. Therefore, Company A's deferred tax liability is \$340. In year 2, Company A estimates that a tax rate of 50 percent will apply when the deferred tax liability is settled. Under APB No. 11, the deferred tax balance remains \$340, while under SFAS No. 109 the balance is adjusted to \$500 by crediting deferred tax liability and debiting deferred income tax expense by \$160. In year 3, 80 percent of the deferred tax liability is settled at the current tax rate of 50 percent. Under APB No. 11 and SFAS No. 109, the deferred tax liability account is debited and the deferred tax expense account is credited by \$400. Additionally, current income tax expense is debited and cash is credited \$400. The deferred tax balance under SFAS No. 109 is \$100 because 80 percent of the deferred item has been realized. However, under APB No. 11, the \$400 debit to deferred tax liabilities effectively creates a deferred tax asset of \$60 which will not provide a future benefit (i.e., a residual). Pursuant to APB No. 11, this \$60 amount will not be eliminated from the firm's balance sheet until the remaining 20 percent of the deferred item is fully realized.

Similarly, SFAS No. 109 requires a firm to recognize deferred tax assets for the effect of deductible temporary differences and operating loss and tax credit carryforwards.⁶ A firm records tax effects at 100 percent of their value to the extent that it is more likely than not (a likelihood of more than 50 percent) that such deferred tax assets will be realized. If a firm does not expect a portion of the deferred tax assets to be realized, the balance of deferred tax assets must be reduced by a valuation allowance amount. In contrast, APB No. 11 did not allow recognition of deferred tax assets created by net operating losses unless their realization was assured beyond a reasonable doubt. Arguably, SFAS No. 109's *more likely than not* criterion is more consistent with the *probable* criterion of SFAC No. 6. If investors value assets in a manner consistent with the criteria of SFAC No. 6, SFAS No. 109's modification to the criterion for recognizing deferred tax assets should provide value-relevant information regarding a firm's deferred tax assets.

The arguments above suggest that the changes in accounting for income taxes made by SFAS No. 109 will result in incremental value-relevant information. However, there are at least two arguments against this view. First, Chaney and Jeter (1994) argue that SFAS No. 109 increases the complexity of accounting for income taxes. If SFAS No. 109's complexity results in inconsistent treatment of deferred taxes across firms, the value-relevance of the net deferred tax liability may be adversely affected.

Second, to the extent that (1) SFAS No. 109 introduces additional subjectivity in the recognition of deferred tax assets, or (2) investors use a more conservative criterion for evaluating deferred tax assets than SFAS No. 109's *more likely than not* standard, SFAS No. 109 may not enhance the value-relevance of deferred tax amounts. For example, Petree et al. (1995) argue that SFAS No. 109 made the measurement and evaluation of deferred tax assets more subjective. If this results in inconsistent application of SFAS No. 109 provisions, SFAS No. 109 may not provide a more value-relevant measure of deferred tax amounts.

Thus, *a priori* there is uncertainty about the incremental value-relevance of SFAS No. 109 amounts relative to APB No. 11. Accordingly, this study tests whether the SFAS No. 109 net deferred tax liability provides investors with additional value-relevant information beyond APB No. 11.

III. SAMPLE

This paper relies on two distinct samples. The first sample (hereafter, sample 1) is used to assess the incremental value-relevance of SFAS No. 109 disclosures relative to APB No. 11 disclosures. The second sample (hereafter, sample 2) is used to assess the incremental value-relevance of the separate disclosure of deferred tax assets, deferred tax liabilities, and the deferred tax asset valuation allowance. A subset of sample 2 is used to assess the incremental value-relevance of the SFAS No. 109 adjustments in deferred tax assets and deferred liabilities for changes in enacted tax rates. Table 1 summarizes the selection process for both of these samples.

⁶ Temporary differences include (1) differences in taxable income and pre-tax financial income and (2) differences in the tax bases of assets or liabilities and their values recognized in the financial statements. Previously, APB No. 11 required recognition of the tax effects of "timing differences" defined as current differences in taxable income and pre-tax financial income (i.e., part (1) of the definition for "temporary differences"). An example of a temporary difference not considered a timing difference under APB No. 11 is the tax effect of differences in the assigned values and tax bases of assets acquired and liabilities assumed in a purchase business combination.

TABLE 1
Summary of the Sample Selection Processes

Total Firms Available on 1993 Compustat	3,400
Less firms with:	
Missing stock share data	446
Missing asset data	549
Missing stock price data	174
Missing deferred tax data	713
Total Firms with Compustat Information	<u>1,518</u>
Less:	
Firms not available from Disclosure Information, Services, Inc.	185
Firms with incomplete deferred tax footnotes	246
Foreign firms not adopting SFAS No. 109	99
Sample 2 ^a	<u>988</u>
Less:	
Firms currently or in the previous two years operating as Master Limited Partnerships or other nontaxable entities	12
Firms adopting SFAS No. 109 before December 1992	33
Firms adopting SFAS No. 96	210
Firms not disclosing a material effect of adopting SFAS No. 109	235
Sample 1 ^b	<u>498</u>

^a Of the 988 firms in sample 2, 456 firms adopted SFAS No. 109 prior to 1993 and provided detailed SFAS No. 109 disclosures in 1992. Thus, sample 2 consists of 1,444 firm-year observations—456 firms in 1992 and 988 firms in 1993.

^b Of the 498 firms in sample 1, 216 firms initially reported SFAS No. 109 amounts in 1992 and 282 firms initially reported SFAS No. 109 amounts in 1993.

Sample 1 is a subset of sample 2. Sample 2 consists of NYSE and AMEX firms drawn from the 1993 Compustat Annual Industrial file. Balance sheet and earnings data are obtained from Compustat, whereas deferred tax data are based upon footnotes to the firm's financial statements. To be included in the sample, a firm must have balance sheet and market value data on the 1993 Compustat tape. Additionally, the firm must have financial statement deferred tax footnote data on the Disclosure Information Services, Inc. database. Foreign firms not electing SFAS No. 109 treatment were excluded from sample 2. Table 1 reveals that sample 2 contains 988 individual firms, but 1,444 firm-year observations—988 firms with SFAS No. 109 data available in 1993 and a 456-element subset of these firms which adopted SFAS No. 109 in 1992.

In addition to sample 2's selection criteria, sample 1 excludes firms operating currently or within the previous two years as Master Limited Partnerships or other nontaxable entities (e.g., S corporations). Due to their current or previous tax-exempt status, the effect of adopting SFAS No. 109 for these firms is either indistinguishable from the effect of changing taxable status, negligible or both. Additionally, sample 1 excludes firms that adopted SFAS No. 96, a proposal for accounting for income taxes whose adoption was allowed but never required. Finally, sample 1 excludes those firms that failed to disclose an incremental

effect from the adoption of SFAS No. 109 relative to APB No. 11.⁷ Table 1 indicates that sample 1 contains 498 firms.

Table 2 presents descriptive data for both samples. Table 2 panel A presents selected information for sample 1 firms and suggests that the typical firm disclosing a material SFAS No. 109 effect experienced a decrease in net deferred tax liabilities from adopting SFAS No. 109.⁸ This is not surprising. Most firms have net deferred tax liabilities, and corporate tax rates decreased in recent years (i.e., the Tax Reform Act of 1986 decreased the maximum tax rate from 46 percent to 34 percent). In addition, SFAS No. 109 increased a firm's ability to recognize deferred tax assets. These factors all suggest that the typical firm that was affected by SFAS No. 109 would realize a decrease in net deferred tax liabilities as a result of adopting SFAS No. 109. Table 2 panel B presents selected information on sample 2 observations. Panel B suggests that the typical firm does not record a valuation allowance under SFAS No. 109. Nonetheless, SFAS No. 109 deferred tax assets and deferred tax liabilities both represent substantial balance sheet amounts (\$1.23 and \$1.75 per share, respectively) for the typical firm.

Table 3 presents simple correlations among deferred tax amounts and other balance sheet amounts for sample firms. Not surprising, table 3 panel A suggests that the effect of adopting SFAS No. 109 is correlated with a firm's APB No. 11 liability. Additionally, as expected, panel B indicates that SFAS No. 109 valuation allowances are significantly correlated with deferred tax assets.

IV. EMPIRICAL METHODS AND RESULTS

Methods

To provide evidence on the incremental value-relevance of the SFAS No. 109 net deferred tax liability, I estimate year-by-year, cross-sectional regressions that relate share prices to financial statement measures of assets, liabilities, the APB No. 11 net deferred tax liability, the SFAS No. 109 cumulative effect, net pension liabilities, and post-retirement liabilities:

$$\begin{aligned} MVE = & \beta_0 + \beta_1 BVA + \beta_2 BVL + \beta_3 APB11 + \beta_4 CUMEFF109 + \beta_5 PENSION \\ & + \beta_6 OPEB + \varepsilon \end{aligned} \quad (1)$$

The dependent variable, MVE, is the market value of common stock for a firm at the end of its fiscal year (firm and time subscripts are suppressed for notational convenience). To mitigate heteroskedasticity, all regression variables are deflated by the number of common shares outstanding. BVA and BVL represent the book values of total firm assets and liabilities, respectively, exclusive of net deferred tax liabilities, net pension liabilities, and post-retirement liabilities. APB11 proxies for the firm's net deferred tax liability under the provisions of APB No. 11. CUMEFF109 captures the cumulative effect necessary to adjust a firm's APB No. 11 net deferred tax liability to the SFAS No. 109 amount. CUMEFF109 is derived from financial statement disclosures and consists of the cumulative effect of

⁷ Firms not disclosing a material SFAS No. 109 effect were likely to have some non-zero impact because of the adoption of SFAS No. 109. Because such an effect was not disclosed, these firms were excluded from sample 1 which was used to assess the incremental value-relevance of SFAS No. 109 disclosures. It should be noted, however, that a regression analysis including these firms assuming that the effect of SFAS No. 109 adoptions was zero was conducted and the results were qualitatively similar to those reported in section IV.

⁸ Nonparametric sign tests indicate that the decrease in the net deferred tax liability from adopting SFAS No. 109 is significantly negative ($p < .0001$). Sixty-eight percent of sample firms experienced a decrease in net deferred tax liabilities as a result of adopting SFAS No. 109.

TABLE 2
Descriptive Statistics for Selected Variables

<u>Variable</u>	<u>Mean</u>	<u>25% Quartile</u>	<u>Median</u>	<u>75% Quartile</u>	<u>Standard Deviation</u>
<i>Panel A: Sample 1; 498 firms used to assess incremental value-relevance of SFAS No. 109 disclosures relative to APB No. 11 disclosures</i>					
MVETOT	2,965	149	672	2,670	7,385
APB11/MVE	0.0775	0.0004	0.0342	0.1277	0.1531
CUMEFF109/ MVE	0.0061	-0.0098	-0.0025	0.0045	0.0591
CUMEFF109/ APB11	0.9848	0.0825	0.2132	0.5740	4.4835
MVE	63.0880	15.3750	24.8750	37.8750	730.8794
BVA	82.2825	17.3436	31.6787	59.4474	742.7948
BVL	40.8186	7.1740	16.9011	32.1864	245.1959
APB11	6.4973	0.0047	0.6632	3.0554	101.5378
CUMEFF109	0.2857	-0.2145	-0.0549	0.1161	3.0720
PENSION	-1.0202	-1.1796	-0.1138	0.0000	2.8737
OPEB	1.1185	0.0000	0.0152	0.7350	3.3695

Panel B: Sample 2; 1,444 firm-year observations used to assess incremental value-relevance of separate disclosure of deferred tax assets, deferred tax liabilities, and the deferred tax valuation allowance

MVETOT	2,652	145	598	2,048	7,073
MVE	39.1454	12.8750	22.8125	35.0625	429.8918
BVA	50.3537	13.1078	23.3499	41.7009	435.3358
BVL	28.9352	5.0034	12.3550	25.3193	147.6665
DTA	2.6019	0.5055	1.2284	2.7282	5.6243
ALLOWANCE	0.3308	0.0000	0.0000	0.1799	1.2932
DTL	5.3859	0.5693	1.7513	4.6297	65.3657
PENSION	-0.8257	-0.8976	-0.0072	0.0000	2.3931
OPEB	1.1088	0.8392	0.0079	0.0000	3.2749

MVETOT = market value of common stock measured at fiscal year end (denominated in millions of dollars).

MVE = MVETOT divided by shares outstanding at end of year.

APB11 = net deferred tax assets or liabilities computed under the provisions of APB No. 11 divided by shares outstanding at end of year. APB11/MVE represents the ratio of APB No. 11 liabilities to firm market value. Positive (negative) values for APB11 indicate that a firm has a net deferred tax liability (asset).

(Continued on next page)

TABLE 2 (Continued)

CUMEFF109	= the cumulative effect necessary to adjust a firm's APB No. 11 net deferred tax liability to the SFAS No. 109 amount divided by shares outstanding. This variable is the cumulative effect of adopting SFAS No. 109 as of the beginning of the firm's fiscal year plus any current-year effects of adopting SFAS No. 109. CUMEFF109/MVE represents the ratio of the SFAS No. 109 cumulative effect to firm market value. Positive (negative) values for CUMEFF109 indicate that a firm had an increase (decrease) in net deferred tax liabilities as a result of adopting SFAS 109. Sixty-eight percent of sample firms experienced a decrease in net deferred tax liabilities as a result of adopting SFAS No. 109.
CUMEFF109/ APB11	= the absolute value of the ratio of the SFAS No. 109 cumulative effect to APB No. 11 liability.
BVA	= the book value of total firm assets exclusive of any net deferred tax assets divided by shares outstanding at end of year.
BVL	= the book value of total firm liabilities exclusive of any net deferred tax liabilities, net pension liabilities, and post-retirement liabilities divided by shares outstanding at end of year.
PENSION	= the firm's accumulated benefit obligation less the fair market value of pension assets divided by shares outstanding at end of year. Positive (negative) values for PENSION indicate that a firm has a net pension liability (asset).
OPEB	= the firm's reported accumulated post-retirement benefit obligation divided by shares outstanding at end of year.
DTA	= the book value of firm deferred tax assets computed under the provisions of SFAS No. 109 divided by shares outstanding at end of year.
ALLOWANCE	= the book value of firm valuation allowances computed under the provisions of SFAS No. 109 divided by shares outstanding at end of year.
DTL	= the book value of firm deferred tax liabilities computed under the provisions of SFAS No. 109 divided by shares outstanding at end of year.

adopting SFAS No. 109, determined as of the beginning of the firm's fiscal year, plus any current-year effects of adopting SFAS No. 109.⁹ APB11 is the end of year SFAS No. 109 net deferred tax liability less CUMEFF109.¹⁰ PENSION is the accumulated benefit obligation associated with the firm's defined benefit pension plan less the reported fair market value of pensions assets. OPEB is the firm's reported accumulated post-retirement benefit obligation. All statistical tests use White's (1980) consistent covariance estimator, and all results are based on analysis after the removal of potential outliers identified using the Belsley et al. (1980) procedures.¹¹

Although this study focuses on net deferred tax liabilities, I include net pension liabilities and other post-retirement liabilities as separate elements in the regression models because these liabilities generally represent substantial financial statement amounts that are correlated with firms' APB No. 11 net deferred tax liabilities, SFAS No. 109 cumulative

⁹ Firms were required to disclose any material effects of applying SFAS No. 109 in the adoption year (i.e., absent cumulative effects, any material differences in current year net income resulting from the application of SFAS No. 109 vs. APB No. 11). Twenty sample firms disclosed material differences in current year net income as a result of applying SFAS No. 109. For these firms, CUMEFF109 is the beginning of year cumulative effect plus current-year effects. For all other firms, CUMEFF109 is the beginning of year cumulative effect of adopting SFAS No. 109.

¹⁰ The current-year effect of adopting SFAS No. 109 was assumed to be zero for firms not disclosing current year effects, so both APB11 and CUMEFF109 are potentially measured with error for firms not disclosing current year effects.

¹¹ These procedures identified 39 (7.8 percent) of the observations as outliers. The inclusion of firms identified as potential outliers does not produce qualitatively different results in any of the following analyses.

TABLE 3
Simple Pearson Correlations*

Panel A: Sample 1; 498 firms used to assess incremental value-relevance of SFAS No. 109 disclosures relative to APB No. 11 disclosures

	<u>MVE</u>	<u>BVA</u>	<u>BVL</u>	<u>APB11</u>	<u>CUMEFF109</u>	<u>PENSION</u>	<u>OPEB</u>
MVE	1.000 [0.001]						
BVA	0.998 [0.001]	1.000 [0.001]					
BVL	0.982 [0.001]	0.992 [0.001]	1.000 [0.001]				
APB11	0.999 [0.001]	0.997 [0.001]	0.980 [0.001]	1.000 [0.001]			
CUMEFF109	0.875 [0.001]	0.873 [0.001]	0.857 [0.001]	0.876 [0.001]	1.000 [0.001]		
PENSION	-0.002 [0.997]	-0.002 [0.973]	-0.014 [0.762]	0.012 [0.785]	0.010 [0.819]	1.000 [0.001]	
OPEB	-0.004 [0.923]	0.005 [0.918]	0.021 [0.633]	-0.024 [0.591]	-0.066 [0.140]	-0.283 [0.001]	1.000 [0.001]

Panel B: Sample 2; 1,444 firm-year observations used to assess incremental value-relevance of separate disclosure of deferred tax assets, deferred tax liabilities, and the deferred tax valuation allowance

	<u>MVE</u>	<u>BVA</u>	<u>BVL</u>	<u>DTA</u>	<u>ALLOWANCE</u>	<u>DTL</u>	<u>PENSION</u>	<u>OPEB</u>
MVE	1.000 [0.001]							
BVA	0.991 [0.001]	1.000 [0.001]						
BVL	0.935 [0.001]	0.970 [0.001]	1.000 [0.001]					
DTA	0.723 [0.001]	0.743 [0.001]	0.761 [0.001]	1.000 [0.001]				
ALLOWANCE	-0.008 [0.766]	-0.002 [0.943]	0.009 [0.722]	0.376 [0.001]	1.000 [0.001]			
DTL	0.997 [0.001]	0.992 [0.001]	0.937 [0.001]	0.740 [0.001]	0.002 [0.948]	1.000 [0.001]		
PENSION	-0.013 [0.618]	-0.004 [0.869]	-0.024 [0.371]	-0.191 [0.001]	-0.031 [0.242]	-0.014 [0.607]	1.000 [0.001]	
OPEB	0.009 [0.738]	0.005 [0.839]	0.044 [0.092]	0.390 [0.001]	0.114 [0.001]	0.010 [0.692]	-0.307 [0.001]	1.000 [0.001]

* All variables are defined in table 2.
Probabilities in brackets are two-tailed.

effect, or both.¹² Additionally, prior research has documented that pension amounts (Landsman 1986; Barth 1991; Choi et al. 1997) and other post-retirement liabilities (Mittelstaedt and Warshawsky 1993; Amir 1993, 1996) are reflected in stock prices and their coefficients are not necessarily the same as the coefficients on other assets and liabilities.

Equation (1) is based on the valuation model where a firm's market value at time t equals the market value of firm assets less the market value of its liabilities at time t . Prior research, including Barth (1991, 1994), Barth and McNichols (1994), Landsman (1986) and Shevlin (1991), used similar regression models to analyze the value-relevance of various financial statement disclosures. In theory, the coefficients in this model for accounting measures of various assets and liabilities should equal one and negative one, respectively, and the intercept should equal zero. However, (1) if accounting measures do not correspond to the market values assessed by investors or (2) if there are omitted variables from equation (1), the estimated coefficients in equation (1) are likely to differ from these theoretical values. In my application, as in others (e.g., Barth and McNichols 1994), the estimated coefficients differ from their theoretical values (e.g., the estimated intercept term is greater than zero). This suggests the presence of correlated omitted variables and/or measurement error. The potential of these factors to contaminate the interpretation of the results must be kept in mind.¹³ Note, however, that in the current and in the previous applications of the basic balance sheet model, that measurement error or correlated omitted variables have not precluded consistent findings of significantly positive coefficients on assets and significantly negative coefficients on liabilities. This provides some comfort that the nature of any existing measurement error and the nature of any correlated omitted variable does not preclude the balance sheet design from providing reasonably interpretable evidence regarding value-relevance. However, in the analysis that follows, coefficient tests and predictions are based on coefficient sign rather than magnitude because of model specification concerns.

Equation (1) is estimated for fiscal years 1992 and 1993. Firms with year-ends from December 1992 through November 1993 (i.e., 1992 adopting firms) constitute the 1992 sample. Likewise, firms with year-ends from December 1993 through November 1994 (i.e., 1993 adopting firms) constitute the 1993 sample. These samples do not overlap because data regarding the impact of SFAS No. 109 are only available in the year the firm adopts SFAS No. 109. These regressions test the coefficient for CUMEFF109 to determine whether CUMEFF109 is negatively associated with firm value.¹⁴ $\beta_4 < 0$ would indicate that the SFAS No. 109 cumulative effect represents additional value-relevant information above and beyond that of APB No. 11.¹⁵

¹² Although table 3 indicates no significant correlation between deferred tax amounts and pension amounts or other post-retirement benefit obligations for sample 1 when 1992 and 1993 SFAS No. 109 adoptions are pooled, pension amounts are significantly positively correlated with the APB No. 11 net deferred tax liability and SFAS No. 109 cumulative effect ($p < .01$) for firms adopting SFAS No. 109 in 1993. Additionally, other post-retirement benefit obligations are significantly positively correlated with the APB No. 11 net deferred tax liability for firms adopting SFAS No. 109 in 1993 ($p < .01$).

¹³ Holthausen (1994) provides an analysis of how the interpretation of the coefficients in these kind of balance sheet designs can be impacted by the presence of measurement error.

¹⁴ Because positive (negative) values for CUMEFF109 indicate an increase (a decrease) in net deferred tax liabilities from adopting SFAS No. 109, CUMEFF109 is tested for a negative association with firm value.

¹⁵ The test of coefficient β_4 in equation (1) is econometrically equivalent to testing $\beta_4 < 0$ in the following regression:

$$MVE = \beta_0 + \beta_1 BVA + \beta_2 BVL + \alpha_3 APB11 + \beta_4 SFAST + \beta_5 PENSION + \beta_6 OPEB + \epsilon \quad (1a)$$

where SFAST is the aggregate SFAS No. 109 net deferred tax liability (i.e., $SFAST = APB11 + CUMEFF109$) and $\alpha_3 = \beta_3 - \beta_4$. Specifically, $\beta_4 < 0$ in equation (1a) indicates that SFAS No. 109 provides value-relevant information incremental to APB No. 11.

Table 4 presents results of year-by-year and pooled cross-sectional regressions of equation (1). Evidence across both sample years and in the pooled regression model indicates that the SFAS No. 109 cumulative effect is significantly negatively associated with firm value. Specifically, the coefficient for CUMEFF109 is significantly negative in each regression equation. This suggests that SFAS No. 109 provides value-relevant information above and beyond that of APB No. 11.¹⁶ Further, the valuation of CUMEFF109 does not significantly differ across sample years ($p = .67$).¹⁷ Thus, SFAS No. 109 amounts for firms choosing to adopt SFAS No. 109 early (i.e., 1992 sample firms) are not valued significantly differently from SFAS No. 109 amounts for firms delaying adoption (i.e., 1993 sample firms).

Table 4 also indicates that the APB11 coefficient is significantly negatively associated with market value, consistent with results in Tse and Holtzman (1995). Evidence in table 4 also indicates that APB No. 11 amounts and amounts specific to SFAS No. 109 may be valued differently. The coefficients for APB11 and CUMEFF109 are significantly different in the 1993 and pooled regressions (i.e., $p < .01$ and $p < .05$, respectively, two-tail t-test).

Finally, evidence in table 4 indicates that firm asset, liability, net pension liability, and other post-retirement liability amounts are significantly associated with the market value of equity. The coefficient for BVA (BVL) is positive (negative) and significant in all regressions. This evidence is consistent with prior research indicating that financial statement measures of assets and liabilities are value-relevant. The coefficients for PENSION and OPEB are negative in all regressions and are significant in the 1992 and pooled regressions, consistent with prior research indicating that net pension liabilities and other post-retirement liabilities are reflected in share prices (Amir 1996; Choi et al. 1997).

Why Do SFAS No. 109 Disclosures Have Incremental Value-Relevance?

The principal differences between SFAS No. 109 and APB No. 11 are the separate recognition of deferred tax assets, the existence of valuation allowances and adjustments for tax law changes. To provide insight into why the SFAS No. 109 net deferred tax liability is more value-relevant than the APB No. 11 liability, I perform separate analyses of these differences to determine their individual value-relevance.

SFAS No. 109 Valuation Allowances

As discussed in section II, SFAS No. 109 eases the requirements for recognizing deferred tax assets but requires a valuation allowance to the extent that a firm's deferred tax assets do not pass the *more likely than not* criterion. In contrast, APB No. 11 uses a more conservative standard for deferred tax asset recognition, but does not require a valuation allowance. To determine if SFAS No. 109's recognition criterion generates value-relevant firm-specific information, the following year-by-year cross-sectional regressions relate share prices to financial statement measures of assets, liabilities, SFAS No. 109 deferred tax

¹⁶ I also compared the value-relevance of the aggregate SFAS No. 109 net deferred tax liability (i.e., APB11 + CUMEFF109) with the APB No. 11 liability using the likelihood test described in Vuong (1989). This test documents, in situations where CUMEFF109 is valued differently than APB11 (i.e., $\beta_3 \neq \beta_4$), whether aggregating these amounts (i.e., $\text{SFAS} = \text{APB11} + \text{CUMEFF109}$) better explain firm value than APB11 alone. Consistent with evidence in table 4, results indicate that the aggregate SFAS No. 109 net deferred tax liability better explains firm value than the APB No. 11 net deferred tax liability.

¹⁷ The test of a difference in the CUMEFF109 coefficients across sample years is based upon a pooled regression that includes the interaction term, CUMEFF109*93, which is equal to CUMEFF109 for 1993 firms, and zero otherwise. A two-tail t-test of CUMEFF109*93 is used to test for a difference in the 1992 and 1993 CUMEFF109 coefficients.

TABLE 4
Regression of Market Value of Equity on Financial Statement Measures and Deferred Tax Liabilities Computed Under APB No. 11 and SFAS No. 109^a

$$MVE = \beta_0 + \beta_1 BVA + \beta_2 BVL + \beta_3 APB11 + \beta_4 CUMEFF109 + \beta_5 PENSION + \beta_6 OPEB + \varepsilon$$

Independent Variables	1992		1993		Pooled Regression	
	Estimate	p-value	Estimate	p-value	Estimate	p-value
Intercept	9.94	.00	8.89	.00	9.31	.00
BVA	1.39	.00	1.21	.00	1.28	.00
BVL	-1.44	.00	-1.23	.00	-1.31	.00
APB11	-2.22	.00	-1.20†	.00	-1.53†	.00
CUMEFF109	-2.23‡	.02	-2.46‡†	.00	-2.44†	.00
PENSION	-0.61	.02	-0.98	.10	-0.74	.01
OPEB	-0.99	.03	-0.47	.17	-0.73	.02
Adjusted R ² /N	.489	188	.484	271	.487	459

All variables are defined in table 2.

All t-statistics and significance levels are based on White (1980) standard errors. Except for the intercept, significance levels are determined using one-tailed tests.

‡ The coefficients for CUMEFF109 do not differ significantly across sample years ($p = .67$, two-tail t-test).

† The coefficients for APB11 and CUMEFF109 are significantly different in the 1993 and pooled regressions ($p < .01$ and $p < .05$, respectively, two-tail t-test).

* Estimation results are after removing the effects of extreme outliers using procedures described by Belsley et al. (1980). Specifically, 28 and 11 observations were classified as outliers in 1992 and 1993, respectively. Inclusion of these observations does not produce qualitatively different results.

assets, SFAS No. 109 valuation allowances, SFAS No. 109 deferred tax liabilities, net pension liabilities, and post-retirement liabilities.

$$MVE = \beta_0 + \beta_1 BVA + \beta_2 BVL + \beta_3 DTA + \beta_4 ALLOWANCE + \beta_5 DTL + \beta_6 PENSION + \beta_7 OPEB + \varepsilon \quad (2)$$

Here, DTA, ALLOWANCE and DTL represent a firm's deferred tax assets, valuation allowance and deferred tax liabilities, respectively, determined in accordance with SFAS No. 109. All other regression variables are as defined in equation (1). In this analysis, $\beta_4 < 0$ would indicate that the SFAS No. 109 valuation allowance is value-relevant. This analysis is based on the 1,444 firms selected for sample 2. In particular, there are 456 and 988 sample firms with detailed SFAS No. 109 disclosures in 1992 and 1993, respectively.

Table 5 presents results of year-by-year and pooled cross-sectional regressions of equation (2). Evidence across both sample years and the pooled regression indicate that the SFAS No. 109 valuation allowance is negatively associated with firm value. Specifically, the ALLOWANCE coefficient is significantly negative in each regression equation. Table 5 also indicates that deferred tax assets and deferred tax liabilities have significant coefficients but that the coefficients are different in magnitude. Specifically, the coefficients for DTA and

TABLE 5

Regression of Market Value of Equity on Financial Statement Measures and Deferred Tax Assets, Valuation Allowances and Deferred Tax Liabilities Computed Under SFAS No. 109^a

$$MVE = \beta_0 + \beta_1 BVA + \beta_2 BVL + \beta_3 DTA + \beta_4 ALLOWANCE + \beta_5 DTL + \beta_6 PENSION + \beta_7 OPEB + \varepsilon$$

Independent Variables	1992		1993		Pooled Regression	
	Estimate	p-value	Estimate	p-value	Estimate	p-value
Intercept	9.03	.00	9.81	.00	9.57	.00
BVA	1.47	.00	1.27	.00	1.33	.00
BVL	-1.47	.00	-1.27	.00	-1.33	.00
DTA	0.85†	.02	0.72†	.02	0.72†	.02
ALLOWANCE	-2.14	.00	-1.45	.01	-1.56	.00
DTL	-2.17†	.00	-1.62†	.00	-1.77†	.00
PENSION	-2.09	.00	-2.21	.00	-2.12	.00
OPEB	-2.44	.00	-2.60	.00	-2.55	.00
Adjusted R ² /N	.485	443	.467	970	.472	1,413

All variables are defined in table 2.

All t-statistics and significance levels are based on White (1980) standard errors. Except for the intercept, significance levels are determined using one-tailed tests.

† The coefficients for DTA is significantly less than the absolute value of DTL's coefficient ($p < .01$ for the 1992, 1993 and pooled regressions, two-tail t-test).

^a Estimation results are after removing the effects of extreme outliers using procedures described by Beksley et al. (1980). Specifically, 13 and 18 observations were classified as outliers in 1992 and 1993, respectively. Inclusion of these observations does not produce qualitatively different results.

DTL are significantly positive and negative, respectively, but DTA's coefficient is significantly less than the absolute value of DTL's coefficient ($p < .01$ for the 1992, 1993 and pooled regressions, two-tail t-test).¹⁸ Taken as a whole, the evidence in table 5 suggests that the separate reporting of deferred tax assets, deferred tax liabilities and the valuation allowance provide incremental value-relevance over the reporting of a single net deferred tax amount.¹⁹

SFAS No. 109 Adjustments for Changes in Enacted Tax Rates

I use regression analysis to assess the value-relevance of SFAS No. 109 adjustments to deferred tax balances for the effects of tax rate changes. In this analysis, I test the value-relevance of SFAS No. 109 adjustments for the tax rate increase enacted in the Revenue Reconciliation Act of 1993. The Act increased the maximum corporate tax rate from

¹⁸ Because APB No. 11 did not require firms to separately disclose deferred tax assets and liabilities, previous analysis was limited to evaluating the value-relevance of net deferred tax liabilities.

¹⁹ I also compared the explanatory power of net deferred tax liabilities vs. separately reported deferred tax assets, valuation allowances and deferred tax liabilities using the likelihood test in Vuong (1989). Consistent with table 5, results indicate that separately reported deferred tax assets, valuation allowances and deferred tax liabilities better explain firm value than net deferred tax liabilities.

34 percent to 35 percent. Pursuant to SFAS No. 109, firms must adjust their deferred tax balances for the effects of tax law changes. Further, SFAS No. 109 requires firms to disclose in the year of enactment any effects of tax law changes that are material to the financial statements. Unlike SFAS No. 109, APB No. 11 does not require firms to modify deferred tax balances for the effects of tax law changes.

To determine if SFAS No. 109's adjustments for tax law changes provide value-relevant firm-specific information, the following year-by-year cross-sectional regressions relate share prices to financial statement measures of assets, liabilities, the SFAS No. 109 net deferred tax liability, the SFAS No. 109 adjustment for the tax rate increase in the Revenue Reconciliation Act of 1993, net pension liabilities and post-retirement liabilities.

$$\text{MVE} = \beta_0 + \beta_1\text{BVA} + \beta_2\text{BVL} + \beta_3\text{SFAS} + \beta_4\text{TXCHG} + \beta_5\text{PENSION} + \beta_6\text{OPEB} + \varepsilon \quad (3)$$

Here, TXCHG represents the disclosed effect of the tax rate increase on a firm's deferred tax liabilities.²⁰ SFAS represents firms' SFAS No. 109 net deferred tax liabilities less TXCHG. All other regression variables are as defined in equation (1). This analysis is based on the 988 firms that provided SFAS No. 109 disclosures in 1993.

Table 6 presents results of the cross-sectional regression of equation (3). β_4 is significantly negative ($p < .01$) and this indicates that the SFAS No. 109 adjustment for tax rate changes is value-relevant. However, the magnitude of the estimated coefficient for TXCHG is larger than expected. One possible explanation for the large magnitude of this coefficient is that the Revenue Reconciliation Act of 1993 increased the tax rate for not only deferred items, but also for other sources of future taxable income. Consequently, the impact of the tax rate increase is much broader than merely an effect on deferred tax liabilities. SFAS No. 109's adjustment is the only disclosure of the effects of tax rate changes. Because SFAS No. 109's adjustment is a function of a firm's expected future tax rate, it is likely that SFAS No. 109's adjustment is positively related to the effect of the change in tax rates on other sources of future income. The large magnitude of the estimated value of β_4 suggests that the SFAS No. 109 adjustment provides value-relevant information with respect to deferred tax amounts, as well as other sources of future taxable income. Of course, there may be other explanations for the surprising magnitude of this coefficient, including the previously mentioned concern about model misspecification.

V. SENSITIVITY ANALYSES

The preceding section provides evidence that SFAS No. 109 net deferred tax liabilities are more value-relevant than APB No. 11 liabilities. This section considers alternative explanations for the result that SFAS No. 109 provides value-relevant information above and beyond APB No. 11.

Discounting

Because net deferred tax liabilities represent tax liabilities payable in future years but are not discounted to their present value under current accounting standards, it is possible that the value-relevance of the SFAS No. 109 cumulative effect results from the cumulative

²⁰ Ninety-two sample firms disclosed tax effects associated with the Revenue Reconciliation Act of 1993. For the remaining sample firms (i.e., those firms not disclosing effects from the Revenue Reconciliation Act of 1993), TXCHG is coded zero. Inferences from regression analyses excluding firms not disclosing effects from the Revenue Reconciliation Act of 1993 are qualitatively similar to those reported in table 6.

TABLE 6
Regression of Market Value of Equity on Financial Statement Measures and Adjustments for
Tax Law Changes Computed Under SFAS No. 109^a

$$MVE = \beta_0 + \beta_1 BVA + \beta_2 BVL + \beta_3 SFAS + \beta_4 TXCHG + \beta_5 PENSION + \beta_6 OPEB + \varepsilon$$

<i>Independent Variables</i>	<i>1993</i>	
	<i>Estimate</i>	<i>p-value</i>
Intercept	7.85	.00
BVA	1.31	.00
BVL	-1.35	.00
SFAS	-1.57	.02
TXCHG	-14.04	.00
PENSION	-0.49	.05
OPEB	-0.58	.03
Adjusted R ² /N	.531	972

SFAS = the book value of net deferred tax assets computed under the provisions of SFAS No. 109 less TXCHG deflated by shares outstanding at the end of the year.

TXCHG = the disclosed effect on deferred tax amounts of the tax rate increase enacted with the Revenue Reconciliation Act of 1993 deflated by shares outstanding at the end of the year.

All other variables are as defined in table 2.

All t-statistics and significance levels are based on White (1980) standard errors. Except for the intercept, significance levels are determined using one-tailed tests.

^a Estimation results are after removing the effects of extreme outliers using procedures described by Belsley et al. (1980). Specifically, 16 observations were classified as outliers. Inclusion of these observations does not produce qualitatively different results.

effect's correlation with discounting. Note that the typical firm experienced a decrease in net deferred tax liabilities due to SFAS No. 109 and that discounting would also generally result in decreased net deferred tax liabilities. Consequently, the value-relevance of the SFAS No. 109 cumulative effect could be attributable to investors' discounting deferred tax amounts.²¹ To determine if discounting could explain the value-relevance of the SFAS No. 109 cumulative effect, I re-estimated equation (1) including only those 155 firms that experienced an *increase* in net deferred tax liabilities or net deferred tax assets due to SFAS No. 109. That is, I re-estimated equation (1) for those firms in which the SFAS No. 109 cumulative effect was inconsistent with the effects of discounting. If discounting explains the value-relevance of SFAS No. 109, one would expect that the SFAS No. 109 effect for these firms to be either not valued or to have a coefficient sign opposite to that in table 4. Results from this analysis are consistent with results reported in table 4 (i.e., the SFAS No. 109 cumulative effect is significantly negative at $p < .02$, $p < .01$ and $p < .01$ in the 1992,

²¹ Discounting could also result in a decrease in net deferred tax assets if the firm has a net deferred tax asset instead of a net deferred tax liability. Further, the effect of discounting is not solely dependent upon the firm's net deferred tax asset or liability position but also the reversal dates of the firm's deferred tax assets and liabilities. The above analysis is based upon the assumption that firm deferred tax assets and liabilities have similar reversal periods.

1993 and pooled regressions, respectively) and, thus, are not reported in detail. This evidence suggests that the value-relevance of the SFAS No. 109 cumulative effect is not solely due to discounting.

Additional Analyses

In addition to the previous analysis, I performed tests to determine if reported results in tables 4 through 6 are sensitive to (1) the set of independent variables included in the regression equations and (2) the choice of deflator. I used net income as well as the following growth proxies as additional independent variables: firm capital expenditures (Daley 1994), market value to book value of assets (Smith and Watts 1992; Gaver and Gaver 1993) and earnings-to-price ratio (Chung and Charoenwong 1991).²² I included growth variables to ensure that SFAS No. 109's value-relevance could not be attributed to SFAS No. 109 amounts proxying for firm growth. I used book value of assets (i.e., BVA) as an alternative deflator. Results including net income and different growth proxies are not qualitatively different from results in tables 4 through 6 and, thus, are not reported. Specifically, the coefficients for CUMEFF109, ALLOWANCE and TXCHG are all significant at $p < .05$ in analyses equivalent to that reported in tables 4, 5 and 6, respectively. Further, results using BVA as an alternative deflator are not qualitatively different from reported results.

VI. SUMMARY AND CONCLUSIONS

SFAS No. 109 represents the culmination of a multi-year process in which the FASB reviewed and subsequently modified the requirements for accounting for income taxes. This study compares SFAS No. 109 and APB No. 11 amounts to determine whether SFAS No. 109 provides additional relevant information regarding a firm's net deferred tax liabilities.

The study first analyzed net deferred tax liabilities for a cross-section of publicly traded firms to determine whether SFAS No. 109 data are value-relevant. This study provides evidence that SFAS No. 109 represents value-relevant information above and beyond APB No. 11. Second, this study provided insight into why SFAS No. 109 net deferred tax liabilities are more value-relevant than APB No. 11 liabilities. Specifically, results suggest that separate recognition of deferred tax assets, the existence of valuation allowances and SFAS No. 109 adjustments for tax law changes are all associated with firm value. Thus, the weight of the evidence presented in this paper suggests that SFAS No. 109 does succeed in providing relevant information about deferred tax assets and liabilities.

²² I lagged all growth variables one period to capture firm growth reflected in current period financial statements.

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Determinants of the Valuation Allowance for Deferred Tax Assets Under SFAS No. 109

Gregory S. Miller
Douglas J. Skinner
University of Michigan

ABSTRACT: This paper explores the determinants of the valuation allowance for deferred tax assets under SFAS No. 109. We find that, consistent with SFAS No. 109, the allowance is larger for firms with relatively more deferred tax assets and smaller for firms with higher levels of expected future taxable income. The most important explanatory variable for the valuation allowance is the level of firms' tax credit and tax loss carryforwards, consistent with these items being more difficult to realize. We find little evidence that managers use the valuation allowance for earnings management purposes, although these tests may not be very powerful.

Key Words: *Deferred taxes, Earnings management, SFAS No. 109, Valuation allowance.*

Data Availability: *Data are publicly available from sources identified in the paper.*

I. INTRODUCTION

This paper presents evidence on how managers have responded to the provisions of Statement of Financial Accounting Standards No. 109 (SFAS No. 109), *Accounting for Income Taxes*, issued by the Financial Accounting Standards Board (FASB) in

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1992. One controversial aspect of the statement is that, unlike previous statements, it requires companies to recognize deferred tax assets for tax credits and tax loss carryforwards, as well as for deductible temporary differences. The statement then requires managers to recognize an offset to their firms' deferred tax assets, known as the valuation allowance for deferred tax assets, to the extent that managers assess that it is "more likely than not" that the deferred tax assets will not be realized. Previous statements simply limited or prohibited the recognition of deferred tax assets related to tax credits and tax loss carryforwards. Because the appropriate level of the allowance depends on managers' expectations about the future realization of their firms' deferred tax assets, this statement requires managers to exercise a considerable amount of judgment.

We examine whether managers appear to set the valuation allowance in accordance with the provisions of SFAS No. 109. The statement indicates that the appropriate level of the allowance depends on the likelihood that firms' deferred tax assets will be realized, which in turn depends on managers' expectations about future levels of taxable income, as well as the level of their firms' deferred tax liabilities relative to deferred tax assets. In addition, since the tax law places restrictions on the realization of tax benefits associated with tax loss carryforwards and credits, it is likely that the level of the allowance depends on the extent to which the firm's deferred tax assets are attributable to these items.

We also investigate whether managers exploit their discretion over the valuation allowance for earnings management purposes. Articles in the business press and practitioner journals argue that the valuation allowance increases managers' ability to manage earnings.¹ Earnings management was also a concern of the FASB when it was considering the statement. There are several reasons to expect that this account may be a useful earnings management tool. First, there are no well-established formulae or clear guidelines for determining the appropriate level of the allowance. Second, the appropriate level of the allowance depends on managers' expectations about future earnings, sometimes decades into the future. Finally, for many firms this provision is large enough to allow managers to make material adjustments to accounting earnings (changes in the allowance have a dollar-for-dollar effect on bottom-line earnings). For example, in 1993 International Business Machines Corporation (IBM) more than doubled its valuation allowance (from \$1.9 billion to \$5.0 billion) while deferred tax assets grew by only about one-third (increasing from \$14 billion to \$19 billion), creating a large "hidden reserve" of earnings that could be utilized in later periods to increase earnings. In 1995, IBM reported an earnings increase of about \$1.2 billion, over half of which (\$683 million) was attributable to a reduction in the valuation allowance.

In order to examine how managers account for the deferred tax asset valuation allowance, we collect data on the deferred tax positions of 200 large firms selected to have relatively large deferred tax assets. We find that there is a good deal of variation across these firms in the level of the valuation allowance. While managers of a number of firms choose no allowance, managers of other firms choose allowances that represent all or a large fraction of their firms' deferred tax assets. This variation is considerable in economic terms when one considers that deferred tax assets represent, on average, about 10 percent of these firms' total assets. We also find that approximately 40 percent of this variation is explained by factors that reflect managers' expectations about whether their firms' deferred tax assets will be realized. First, our results indicate that a statistically significant part of

¹ For example, see Comiskey and Mulford (1994), Peavey and Nurnberg (1993) and Petree et al. (1995). Also see Khalaf (1993), in which the following claim is made: "With Statement 109, accounting rulemakers have created an incredible earnings management tool," charges Shearson Lehman Brothers tax and accounting expert Robert Wilkens. "This reserve is a mass with which you can do whatever you want."

the variation in the valuation allowance is explained by variables that proxy for managers' expectations about future taxable income and their firms' net deferred tax positions. Second, we find that the extent to which deferred tax assets represent operating loss, tax credit or other carryforward items is a particularly strong explanatory variable for the valuation allowance. This indicates that many managers set the allowance based on the level of their firms' carryforward items, consistent with these items being more difficult to realize.

We find little evidence that managers of sample firms use the valuation allowance for earnings management purposes. However, because our primary interest is to examine whether managers comply with the provisions of SFAS No. 109, we sample firms based on the magnitude of their deferred tax assets rather than on their economic circumstances. As a result, managers of sample firms are unlikely to have similar incentives to manage earnings, so our earnings management tests may not be very powerful. And some argue that managers use the valuation allowance as a "hidden reserve" of earnings to help smooth reported income, but with only two years of post-implementation SFAS No. 109 data it is difficult to test this idea.

The next section presents the research hypotheses in more detail. Section III discusses three examples of how the allowance is set in particular companies, while section IV details the research design and provides descriptive statistics for sample firms. Section V provides evidence on factors that affect the level of and changes in the valuation allowance. Section VI concludes the paper.

II. HYPOTHESIS DEVELOPMENT

Tax Hypotheses: Accounting for the Valuation Allowance for Deferred Tax Assets Under SFAS No. 109

The valuation allowance for deferred tax assets was created in early 1992 when the FASB adopted SFAS No. 109, which applies to fiscal years beginning after December 15, 1992. The principal difference between SFAS No. 109 and the previous statement on accounting for income taxes, SFAS No. 96 (FASB 1987), is that SFAS No. 109 requires firms to recognize deferred tax assets for the tax benefits of operating loss and tax credit carryforwards, as well as for deductible temporary differences. SFAS No. 96 did not permit the recognition of deferred tax assets associated with the benefits of tax credit or operating loss carryforwards, no matter how likely the firm was to realize these benefits, and this was one of the reasons for its demise.² Once deferred tax assets have been recognized under SFAS No. 109, they must then be reduced if "based on the weight of available evidence, it is *more likely than not* (a likelihood of more than 50 percent) that some portion or all of the deferred tax assets will not be realized. The valuation allowance should be sufficient to reduce the deferred tax asset to the amount that is more likely than not to be realized" (FASB 1992, para. 17(e)) (emphasis in the original). Adjustments to the valuation allowance flow directly to income from continuing operations on an after-tax basis through the provision for deferred taxes (tax expense) and thus affect reported net income on a dollar-for-dollar basis.³

² SFAS No. 96 was also criticized for being too complex in requiring both the detailed scheduling of reversals of future temporary differences and consideration of hypothetical tax-planning strategies (FASB 1992, para. 283). The predecessor statement to SFAS No. 96, APB No. 11 (APB 1967), precluded recognition of the tax benefits associated with tax credit carryforwards altogether, and allowed recognition of the tax benefits for operating loss carryforwards only when realization was assured "beyond a reasonable doubt." Both SFAS No. 96 and SFAS No. 109 implement an asset-liability approach to accounting for income taxes, in contrast to APB No. 11, which implements the deferral approach.

³ The statement specifically indicates that adjustments to the valuation allowance must be reported as income from continuing operations (FASB 1992, para. 26).

The realization of deferred tax assets depends principally on the existence of taxable income of sufficient amount and appropriate character. According to the statement, there are four sources of such taxable income: (1) future reversals of existing taxable temporary differences; (2) future taxable income exclusive of reversing temporary differences; (3) taxable income in prior carryback years if carryback is permitted under the tax law; and (4) tax-planning strategies. (1) and (2) are likely to be the most important sources of taxable income since (3) and (4) are limited in scope.⁴

The two major sources of taxable income imply that the appropriate level of the allowance under SFAS No. 109 depends on two factors. First, the allowance will be smaller the larger the firm's available taxable temporary differences, although the taxable temporary differences must reverse in the period that the deductible temporary differences reverse if such taxable differences are to be utilized as sources of taxable income. Second, the allowance will be smaller for firms with larger (expected) future taxable income, although, once again, that income must occur in periods that coincide with reversals of the deductible differences.⁵

In addition, the tax law places important limitations on the extent to which the tax benefits associated with carryforward items can be realized, and thus SFAS No. 109 indicates that the taxable income must also be of the "appropriate character." For example, net operating loss carryforwards may usually only be used to offset taxable income in the same tax jurisdiction. Thus, the likelihood that net operating loss carryforwards will be realized is usually lower if they are state or foreign loss carryforwards and will vary according to the particular rules that apply in each jurisdiction (which may be more restrictive than those that apply to U.S. federal loss carryforwards). There are also restrictions on the utilization of U.S. federal tax loss and tax credit carryforwards. For example, the law imposes restrictions on the extent to which purchased loss carryforwards can be utilized to offset taxable income reported by the purchasing firm. Similar restrictions apply to capital loss carryforwards (which can only be utilized to offset capital gains realized in the same jurisdiction), as well as to tax credit carryforwards. In general, there are likely to be important restrictions on the extent to which carryforward items can be realized. Therefore, the amount of the valuation allowance will be greater for firms with large carryforwards.⁶

This discussion leads to the following hypotheses about factors that affect the level of the valuation allowance if managers choose the level of the allowance based on the principles espoused in SFAS No. 109. We refer to these as our three "tax hypotheses."

Hypothesis 1: Firms with more deferred tax liabilities (more available taxable temporary differences) are more likely to realize their deferred tax assets and hence will appropriately have a smaller valuation allowance.

Hypothesis 2: Firms with more expected future taxable income are more likely to realize their deferred tax assets and hence will appropriately have a smaller valuation allowance.

⁴ For example, (3) usually applies to situations where there are future reversals of deductible temporary differences during periods in which the firm reports pre-tax losses. The firm is able to realize these benefits by carrying them back to prior years in which taxable income is reported. (4) applies to situations in which management takes actions that otherwise would not be taken to prevent, for example, a tax loss carryforward from expiring unused (e.g., switching from tax-exempt to taxable investments).

⁵ Details about the periods in which taxable and deductible differences reverse are not available in tax footnotes.

⁶ Details about jurisdiction, carryforward period, the extent of purchased carryforwards, etc., are not consistently available in tax footnotes.

Hypothesis 3: Firms with more deferred tax assets attributable to tax loss or tax credit carryforward items are less likely to realize their deferred tax assets and so will appropriately have a larger valuation allowance.

Earnings Management Hypotheses

To test the notion that managers choose the level of the valuation allowance opportunistically, we also examine two earnings management hypotheses. These hypotheses are well known in the literature (e.g., Watts and Zimmerman 1986), so we describe them briefly.

Leverage Hypothesis: Many papers investigate whether managers' accounting choices vary as a function of their firms' financial leverage. The argument here is that the extent to which firms are close to binding debt covenants increases with their leverage so that managers of more highly levered firms have stronger incentives to make income- (and net asset-) increasing accounting decisions. This suggests that managers of more highly levered firms will choose a smaller valuation allowance.

Smoothing Hypothesis: A long-standing view in the accounting literature and business press is that managers use their accounting discretion to reduce fluctuations in reported income, often to maintain the appearance of a smoothly increasing earnings series. If this is the case, we expect that managers use the valuation allowance as a "hidden reserve" of earnings, choosing to reduce the allowance (and increase income) in years when earnings are temporarily depressed and increase the allowance (decreasing income) in years when income is temporarily high or too low for this choice to matter (in loss years, for example).⁷

In our empirical tests we examine how the level of the valuation allowance varies across firms at a single point in time, as well as how firms change the allowance from one year to the next. While we test the leverage hypothesis in both levels and changes, smoothing is only amenable to testing by examining changes in the valuation allowance.

III. THREE EXAMPLES OF HOW THE VALUATION ALLOWANCE IS SET

In this section, we present three examples of how the level of the valuation allowance is set. These examples are not necessarily instances of earnings management, but illustrate that managers have a good deal of latitude in setting the level of the valuation allowance. The examples are drawn from annual report disclosures of Delta Air Lines, Tandem Computers and IBM.

At the end of fiscal 1994, Delta Air Lines' deferred tax assets were substantially larger than their deferred tax liabilities (\$2,089 million vs. \$1,193 million), and represented in part the anticipated benefits of net operating loss and alternative minimum tax credit carryforwards (\$422 million). In addition, for each of the years 1991 through 1994, Delta incurred substantial operating (and net) losses, so that by the end of 1994 Delta's stockholders' equity stood at \$1,467 million, down from \$2,547 million at the end of 1991. At

⁷ Khalaf (1993) argues that the valuation allowance is used as a hidden reserve of earnings. For an example of the belief that major companies smooth earnings, see "How GE Damps Fluctuations in its Annual Earnings," *Wall Street Journal* (1994).



year-end 1994 Delta's debt/equity ratio stood at 7.1. Given the SFAS No. 109 rules, these factors suggest that Delta's financial position at the end of 1994 was tenuous (given its history of operating losses) and that a substantial valuation allowance was indicated. However, Delta's management decided that *no* allowance was necessary, arguing that "Management believes, based on the Company's earnings history, the actions that the company has already taken and will continue to take to improve its financial performance, expectations of future income, and other relevant considerations, that it is more likely than not that future taxable income will be sufficient to fully utilize the deferred tax assets that existed at June 30, 1994." It would seem that Delta's managers either had very positive information about the future or that this represents aggressive accounting, especially since SFAS No. 109 specifically requires that more weight be placed on objective and verifiable information.⁸

The case of Tandem Computers Inc. (1994) stands in marked contrast to Delta. As with Delta, Tandem had a substantial excess of deferred tax assets over deferred tax liabilities: at the end of 1994, deferred tax assets stood at \$293 million while deferred tax liabilities were \$96 million. Of the deferred tax assets, \$62 million comprised the benefits of tax credit or loss carryforwards. In addition, its recent financial performance had been mixed, although it was arguably better than that of Delta. Tandem had incurred operating and net losses in 1992 and 1993 (although most of the 1993 loss was due to a restructuring charge) but recorded operating (and net) income in 1994. In 1994, Tandem's ROE was 18 percent and at the end of 1994 the company's debt/equity ratio stood at 0.9. Tandem was therefore in a relatively good financial position, despite its losses in 1992 and 1993. Nevertheless, Tandem's management set a very large allowance at the end of 1994. The allowance comprised 67 percent of deferred tax assets at the end of 1994 and was set so that the company's net deferred tax assets (after subtracting the allowance) exactly equaled its deferred tax liabilities, so that deferred taxes netted to zero on the balance sheet. The contrast between how Delta and Tandem set their allowances, despite their otherwise similar circumstances, clearly illustrates the degree of latitude available to managers in setting the allowance.

IBM's policy on accounting for deferred taxes between 1992 and 1995 illustrates how a company might use the valuation allowance as an income smoothing device. In 1993 IBM managers chose to increase the allowance substantially: in that year the firm's deferred tax assets increased from \$14.0 billion to \$19.2 billion (by 36 percent), while the valuation allowance was increased from \$2 billion to \$5 billion, so that it nearly doubled as a proportion of deferred tax assets (from 14 percent to 26 percent). According to the tax footnote, this increase was due mainly to the 1993 restructuring charge. In 1992 and 1993, IBM took (pre-tax) restructuring charges of \$11.6 billion and \$8.9 billion, respectively, which resulted in net losses of \$5.0 billion and \$8.1 billion in those years. Because these losses are due to transitory items, they are less likely to justify a valuation allowance than operating losses.⁹ It is evident that a large part of the temporary difference relating to the restructuring charge must have reversed in 1994, because this component of deferred tax assets declined from \$5.2 billion at the end of 1993 to \$2.4 billion at the end of 1994. However, in 1994

⁸ There is evidence in the company's 1994 annual report that it was close to violating debt covenants during 1993 and 1994 (see footnote 5). As it turns out, Delta was profitable in both 1995 and 1996, so management's expectations at year-end 1994 may have been justified *ex post*.

⁹ SFAS No. 109 indicates that managers should consider whether losses are transitory.

the allowance declined by only \$.5 billion. It is thus difficult to understand why the allowance increased so dramatically in 1993.¹⁰ One possible explanation is that earnings management is at work, and that increasing the allowance to \$5 billion, done in a bath year, gave IBM managers a good deal of "slack" to smooth earnings in future years. In fact, in 1995 IBM reported a bottom-line earnings increase of about \$1.2 billion (reported earnings increased from \$3,021 million to \$4,178 million), over half of which (\$683 million) was attributable to a decline in the valuation allowance.

IV. RESEARCH METHOD AND SAMPLE SELECTION

We collect a sample of firms that have relatively large deferred tax assets because these are the firms that potentially have the largest valuation allowances and whose managers therefore have the most discretion. To construct a sample of firms with large and long-standing deferred tax assets, we choose firms that took relatively large Other Post-Employment Benefit (OPEB) charges when they adopted Statement of Financial Accounting Standards No. 106 (SFAS No. 106), *Employers' Accounting for Post-Retirement Benefits Other Than Pensions* (FASB 1990). For most companies, the OPEB charge creates a large temporary deductible difference that gives rise to a deferred tax asset (OPEB costs are not deductible for tax purposes until they are paid). In many cases, this temporary difference will not reverse for many years (usually 20 or more), which also increases the level of judgment involved. This selection procedure is necessary because the level of deferred tax assets is not separately reported on any large scale database.

To generate this sample, we screen the annual industrial Compustat file for firms with an OPEB charge in 1992 or 1993, when most firms adopted SFAS No. 106.¹¹ Limiting our sample to firms that chose to implement SFAS No. 106 by taking an immediate charge (as opposed to amortizing this amount over future periods) should not limit the generalizability of our results because the large majority of industrial firms chose to implement the Statement in this manner.¹² We eliminate regulated companies, firms in bankruptcy, publicly traded subsidiaries of foreign companies, and firms with annual sales of less than \$500 million, and rank the remaining firms based on the ratio of their OPEB charge to sales in the adoption year. We then choose 200 firms with the largest OPEB charge/sales ratios that also have annual report data available on Laser Disclosure.¹³ The average (median) OPEB charge/sales for this sample is 6.1 percent (4.1 percent) and average (median) annual sales is \$6.3 billion (\$2.7 billion). The final sample is thus composed of fairly large and well-established industrial companies.

Table 1 provides descriptive statistics on the deferred tax positions of sample firms. We obtain these data from firms' tax footnotes and from Compustat. In this and other tables

¹⁰ Changes in the allowance are not attributable to changes in the level of tax credits and tax loss carryforwards. In total, these amounts change from \$2.3 billion at the end of 1992 to \$3.5 billion at the end of 1993 and \$2.5 billion at the end of 1994.

¹¹ We use footnote information associated with Compustat item #183, cumulative effect of accounting changes, to identify firms that charged the full OPEB amount to earnings in the adoption year rather than amortizing this amount over future periods. This footnote information specifically identifies these firms as "SFAS No. 106 transition obligation *not amortized*."

¹² Of the 1,596 Compustat firms for which this choice is reported, 1,117 (70 percent) are classified as firms that implement SFAS No. 106 by taking an immediate charge to earnings.

¹³ We limit the sample to firms with sales over \$500 million because of our belief that managers of larger firms are more likely to have both incentives and opportunities to engage in income smoothing. In addition, many smaller firms with high OPEB charge/sales ratios were in financial difficulty and we wanted to avoid biasing our sample toward financially distressed firms (which are more likely to have to report a relatively large valuation allowance). We limit the sample to 200 firms because of the relatively high cost of collecting tax footnote data for sample firms.

TABLE 1
Descriptive Statistics on the Deferred Tax Positions of 200 Firms that Adopt
SFAS No. 109 During 1992-1994

	<i>DTA/TA</i>	<i>(DTA-DTL)***</i> <i>TA</i>	<i>(DTA-DTL)***</i> <i>DTA</i>	<i>Allowance***</i> <i>DTA</i>	<i>Carryforwards***</i> <i>DTA</i>
Year 0 (Obs. = 200)					
Mean	.109	.029	-.056	.122	.140
Median	.082	.013	.210	.046	.071
Minimum	.003	-.263	-4.670	.000	.000
Maximum	.851	.841	.989	1.000	.866
N > 0		125 (63%)	125 (63%)		
N = 0				71 (36%)	72 (36%)
Year 1 (Obs. = 199)					
Mean	.111	.030	-.052	.118	.152
Median	.081	.021	.281	.042	.080
Minimum	.002	-.223	-5.155	.000	.000
Maximum	.729	.717	.984	1.000	.812
N > 0		126 (63%)	126 (63%)		
N = 0				70 (35%)	69 (35%)
Year 2 (Obs. = 188)					
Mean	.107	.023	-.056	.115	.156
Median	.080	.021	.260	.043	.080
Minimum	.002	-.237	-7.176	.000	.000
Maximum	.731	.526	.986	1.000	.807
N > 0		117 (62%)	117 (62%)		
N = 0				66 (35%)	62 (33%)

Sample comprises 200 firms with relatively large ratios of adoption-year other post-employment benefits (OPEB) charge to sales ratios and annual sales of at least \$500 million. Data are from the tax footnotes of firm annual report/Form 10K filings or Compustat. Variables are defined as follows (with data sources in parentheses):

DTA = deferred tax assets (firm's tax footnote).

TA = total assets (Compustat data item #5).

DTL = deferred tax liabilities (firm's tax footnote).

Allowance = valuation allowance for deferred tax assets (firm's tax footnote).

Carryforwards = the sum of tax loss and tax credit carryforwards and credits (firm's tax footnote).

we present data for three event years, where year zero is the year in which the firm adopts SFAS No. 109 (fiscal 1992 or 1993). The fact that sample firms adopt SFAS No. 106 and SFAS No. 109 concurrently is probably not coincidental because the more liberal treatment of deferred tax assets in SFAS No. 109 allowed firms to "cushion" the impact of the OPEB charge on after-tax earnings.

Table 1 reports on the level of the valuation allowance for these firms. We report the allowance deflated by deferred tax assets, and use this ratio as the dependent variable in our tests. The allowance comprises 12.2 percent (4.6 percent) of deferred tax assets for the average (median) firm in year 0 and declines slightly in subsequent years. There is substantial variation in the level at which managers set the allowance. Managers of 36 percent of sample firms set the allowance at zero. At the other extreme, managers of 13 firms set the allowance at very high levels (more than 50 percent of their deferred tax assets), which

explains the positive skewness. In addition, changes in the allowance *potentially* have a material earnings effect for most sample firms because managers can set the allowance anywhere from zero to 100 percent of deferred tax assets, meaning that, for the average firm, the allowance can change by as much as 10 percent of total assets in any given year.

V. EVIDENCE

What Determines the Level of the Valuation Allowance?

To test the three tax hypotheses, we need measures of these firms' net deferred taxes (H1), their expected future taxable income (H2), and the extent to which their deferred tax assets are comprised of the tax benefits of tax loss and tax credit carryforwards (H3). Measures of net deferred taxes and tax loss and tax credit carryforwards are available directly from tax footnotes. We measure net deferred taxes as deferred tax assets minus deferred tax liabilities deflated by deferred tax assets, and tax loss and tax credit carryforwards as the fraction of deferred tax assets represented by these items. We view deferred tax assets as the natural deflator for these variables and for the valuation allowance, and report descriptive statistics for both variables in table 1.¹⁴ In year 0, mean (median) deferred tax assets represent 11 percent (8 percent) of total assets, and mean (median) *net* deferred tax assets represent 2.9 percent (1.3 percent) of total assets. Most sample firms are in net deferred tax asset positions (63 percent) and net deferred tax assets represent 21 percent of deferred tax assets for the median firm. Average net deferred tax assets are -5.6 percent of deferred tax assets, but this negative mean is driven by a few firms with very large deferred tax liabilities (seven firms have deferred tax liabilities that are at least twice the amount of their deferred tax assets). Because of this negative skewness, we winsorize this variable at -100 percent in subsequent empirical tests.¹⁵ Carryforward items represent 14 percent (7.1 percent) of deferred tax assets for the mean (median) sample firm, and 64 percent of sample firms report carryforward items.¹⁶

Measures of managers' expectations of future taxable income (for H2) are less obvious, so we use several proxies: (1) recent past financial performance (specifically indicated as being important in SFAS No. 109); (2) the firm's dividend history and recent changes in dividend policy (because dividends are often regarded as conveying managerial expectations about future earnings); (3) I/B/E/S consensus forecasts of the next two years' annual earnings and long-run earnings growth; (4) Altman's Z-score (a measure of the likelihood that the corporation will survive)¹⁷; (5) realized future financial performance (on the assumption that managers have perfect foresight); and (6) a variable that is often considered to proxy for the market's expectations of future earnings growth, the market-to-book ratio.¹⁸

We measure recent past financial performance in year t as average return on assets (ROA) over years $t-3$, $t-2$ and $t-1$ (if year $t-3$ ROA is not available, we average over

¹⁴ This follows because the valuation allowance relates directly to the components of deferred tax assets, and is analogous to deflating the allowance for doubtful debts by accounts receivable.

¹⁵ Although 30 percent of sample firms are affected by this winsorization, the tenor of our results (significance of the net deferred assets variable) is not affected by this procedure.

¹⁶ The proportion of firms with tax loss or tax credit carryforwards may appear high, but we do not think it is unusual for several reasons. First, the overall proportion of firms reporting losses has increased over time, and is now fairly high in absolute terms. Hayn (1995, table 1) reports that around one third of Compustat firms report operating losses in each year, 1986-1990. Second, this proportion includes tax credits as well as tax loss carryforwards, so this variable does not necessarily indicate that the firm is unprofitable. Third, tax loss carryforwards include state as well as federal tax losses, which also makes it difficult to make strong inferences about the profitability of sample firms.

¹⁷ Although we do not expect, given our sample-selection procedures, that many of our firms will go bankrupt, we include the Z-score as a summary measure of relative financial strength.

¹⁸ Many sample firms report losses in year 0, so we do not use the P/E ratio as a growth proxy in our tests.

years $t-2$ and $t-1$). To calculate ROA we use net earnings for the year and divide by total assets at the end of the previous year. The dividend history variable is measured as the number of consecutive years, beginning with year 0 and moving back through time, that the firm pays dividends. Dividend growth is measured as the annualized geometric growth rate in dividends per share (adjusted for stock splits and dividends) from year $t-2$ through year t .¹⁹ Observations for which dividends are initiated or omitted in year t are treated as missing, as are observations for which the firm did not pay any dividends.

To obtain analysts' forecasts of ROA, we multiply I/B/E/S forecasts of each of the next two years' annual EPS by the number of shares outstanding, deflate by year 0 total assets, and then take the average. We use I/B/E/S long-run (five-year) earnings growth forecasts as given.

Altman's Z-score (Altman 1983) is calculated using the coefficients reported by Shumway (1997) as:

$$Z = 5.1X1 + 1.0X2 + 6.2X3 + .1X4 + 1.7X5$$

where:

- X1 = working capital/total assets,
- X2 = retained earnings/total assets,
- X3 = EBIT/total assets,
- X4 = market value of equity/book value of liabilities,
- X5 = Sales/total assets.

Realized future earnings performance in year t is measured as average operating ROA (based on operating income after depreciation) in years $t+1$ and $t+2$ (if year $t+2$ data are not available, then we take operating ROA in year $t+1$ only). We use operating earnings to ensure that our earnings measure is not affected by changes in the valuation allowance, as an after-tax earnings measure would be. The market-to-book ratio is measured as the ratio of the market value of the firm's common equity to the book value of common equity at fiscal year-end.

Table 2, panel A presents descriptive statistics on the H2 variables—average past ROA, dividend growth, dividend history, I/B/E/S forecasts of ROA and long-run earnings growth, the Z-score, realized future ROA, and the market-to-book ratio—for year 0. (Numbers for the two subsequent event years are similar and so are not reported.) Sample firms' average past ROA seems low in absolute terms—the mean (median) is 4.6 percent (3.6 percent), which suggests that these firms are performing relatively poorly during this period. In addition, we find that the time series of mean (median) ROA based on bottom-line net income for these firms for the five years up to and including the adoption year is 6.3 percent (6.4 percent) in year -4 , 5.9 percent (5.0 percent) in year -3 , 3.4 percent (3.5 percent) in year -2 , 2.6 percent (3.1 percent) in year -1 , and $-.9$ percent ($-.1$ percent) in the adoption year, indicating that these firms' financial performance declines through year 0. One hundred firms (50 percent of the sample) report net losses in the adoption year, which is not surprising given these firms take the OPEB charge in this year. It seems that managers of many of these firms treat year 0 as a "bath" year. We do not include year 0 earnings in any of our H2 measures because managers' choices of the year 0 allowance affect year 0 earnings directly, potentially inducing a correlation unrelated to our hypothesis.

¹⁹ Specifically, we subtract one from the square root of the ratio of the adjusted dividend in year t to the adjusted dividend in year $t-2$.

TABLE 2
Descriptive Statistics for and Correlations Among Measures of Expected Future Taxable Income in Event Year 0

Panel A: Descriptive Statistics						
	Average Past ROA	Dividend Growth	Number of Dividends	I/B/E/S Expected ROA	I/B/E/S Expected Growth	Z-Score
Obs.	191	160	200	189	181	166
Mean	4.65%	1.67%	7.73	5.60%	11.36%	3.36
Median	3.64%	3.17%	10	4.73%	11.08%	3.28
Minimum	-13.85%	-69.85%	0	-44.12%	4.17%	.72
Maximum	44.40%	182.84%	10	50.45%	21.67%	12.24
						196
						10.13%
						9.18%
						-.31%
						88.32%
						186
						3.16
						2.56
						.45
						17.91
Panel B: Pearson Correlation Coefficients						
Average Past ROA	1.00	.24	.28	.38	.24	.50
Dividend Growth		1.00	-.14	.25	.43	.22
Number of Dividends			1.00	.31	.01	.29
I/B/E/S Expected ROA				1.00	.35	.65
I/B/E/S Expected Growth					1.00	.21
Z-Score						1.00
Realized Future ROA						.69
Market-to-Book Ratio						1.00

(Continued on next page)

TABLE 2 (Continued)

Variable definitions are as follows (Compustat data item numbers are shown in parentheses where applicable):

Average Past ROA in year t represents the average of ROA_{t-1} , ROA_{t-2} and ROA_{t-3} , where ROA_t is defined as $(\#18 + \#48)/\#6_{t-1}$.

Dividend growth measured as the annualized geometric growth rate in dividends per share, adjusted for stock splits and dividends, $(\#26/\#27)$ from year $t-2$ through year t . Specifically, we subtract one from the square root of the ratio of the adjusted dividend in year t to the adjusted dividend in year $t-2$.

Number of dividends represents the number of consecutive dividends, beginning in year 0 and moving back through time for a maximum of ten years, that the firm pays dividends (defined as a positive value for $\#21$).

$I/B/E/S$ expected ROA in year t is measured as the average of expected EPS for year $t+1$ and $t+2$ (multiplied by the number of common shares outstanding), deflated by total assets in year t .

$I/B/E/S$ expected growth is expected growth rate in EPS for the next five years.

Altman's Z-score (Altman 1983) is calculated using the updated coefficients reported by Shumway (1997) as:

where: $Z = 5.1X1 + 1.0X2 + 6.2X3 + .1X4 + 1.7X5$

$X1 = \text{working capital/total assets} = (\#4 - \#5)/\#6$

$X2 = \text{retained earnings/total assets} = \#36/\#6$

$X3 = \text{EBIT/total assets} = (\#170 + \#15)/\#6$

$X4 = \text{market value of equity/book value of liabilities} = (\#24 \times \#25)/(\#6 - \#60)$

$X5 = \text{Sales/total assets} = \#12/\#6$

Realized future earnings performance in year t is measured as average operating ROA (based on operating income after depreciation) in years $t+1$ and $t+2$ (if year $t+2$ data are not available, then we take operating ROA in year $t+1$) $(\#178/\#6)$.

The market-to-book ratio is measured as the ratio of the market value of the firm's common equity to the book value of common equity at the firm's fiscal year end $[(\#199 \times \#25)/\#60]$.

The dividend variable indicates that most sample firms have a long dividend history—the median firm has paid annual dividends for at least ten consecutive years and dividend growth for the mean (median) dividend-paying sample firm is 1.7 percent (3.2 percent). On the other hand, 30 firms (15 percent of the sample) do not pay a dividend in year 0.

The mean (median) Z-score is 3.36 (3.28), and 29 percent of sample firms have Z-scores below 2.38, the indicated cutoff for a high likelihood of bankruptcy. Since 20 percent of the population of firms falls into this category (this is how the cutoff is determined), these data indicate that this sample of firms is in slightly worse financial condition than the population. The mean (median) I/B/E/S forecast of ROA for the next two years is 5.6 percent (4.7 percent), and the mean (median) I/B/E/S forecast of long-range earnings growth is 11.4 percent (11.1 percent), both of which indicate that analysts expect improved financial performance for these firms. In addition, realized future operating performance for these firms is strong—mean (median) average future operating ROA is 10.1 percent (9.2 percent). Finally, these firms' market-to-book ratios indicate that the market in general expects these firms to grow—the mean (median) market-to-book ratio is 3.2 (2.6).

Table 2, panel B presents correlations among the H2 variables. If these variables are reliable proxies for managers' expectations of future performance, we expect relatively high correlations. The results bear this out. For example, the correlations between average past ROA, the Z-score, I/B/E/S estimates of ROA in the next two years, and realized future ROA are all high, ranging from .38 to .76. This indicates that actual past and future ROA measures, as well as estimates of future ROA, all tend to capture a single dimension of financial performance. The Z-score also seems to be heavily influenced by these financial performance measures. In addition, the market-to-book ratio is highly correlated with these measures; the correlation between market-to-book and average past ROA is .42, between market-to-book and I/B/E/S estimates of ROA is .53, and between market-to-book and realized future ROA is .51. Overall, the H2 proxy variables are positively correlated, suggesting that they capture a common underlying construct or constructs.

We perform a factor analysis of these proxy variables to investigate more formally whether they capture the same underlying construct(s). Table 3 contains the factor loadings from a principal factor analysis. We report the results of the factor analysis for years 0 and 1 in panels A and B of the table, respectively. The results for year 2 are not reported due to a smaller sample size.²⁰ The factor analysis identifies three factors in year 0 and two factors in year 1. The first factor is similar in each year, and seems to capture financial performance. In years 0 and 1, the variables that have "large" factor loadings for the first factor are average past ROA (.83 and .81), I/B/E/S estimates of ROA (.89 and .94), the Z-score (.88 and .64), and realized future ROA (.84 and .95). In each of these years this factor captures the bulk of the variation in these variables: the percentage of variance explained by this factor is 66 percent in year 0 and 78 percent in year 1. It thus seems that these firms' financial performance is captured by a single factor in each year. The second factor identified in each year is also similar for both years, although this second factor seems less important (explaining only about 21 percent of the variation in each year). Overall, we conclude that two constructs likely underlie H2, but that the first of these is

²⁰ We use an oblique (promax) rotation after standardizing all variables to have mean zero, variance one (Johnson and Wichern 1992). To perform the factor analysis, SAS requires complete data on all variables, which means that we have fewer than 100 observations in year 2.

TABLE 3
Factor Analysis of Measures of Expected Future Taxable Income^a

	<u>Factor 1</u>	<u>Factor 2</u>	<u>Factor 3</u>
<i>Panel A: Event Year 0 Factor Loadings</i>			
Average Past ROA	.827	.005	-.024
Dividend Growth	.109	.579	-.403
Number of Dividends	.030	-.121	.377
I/B/E/S Expected ROA	.891	.092	.061
I/B/E/S Expected Growth	-.083	.651	.030
Z-Score	.880	-.100	-.108
Realized Future ROA	.844	.004	.101
Market-to-Book Ratio	.300	.252	.440
Percent of variance explained	65.9	21.2	12.9
<i>Panel B: Event Year 1 Factor Loadings</i>			
Average Past ROA	.810	-.008	
Dividend Growth	.041	.560	
Number of Dividends	.168	-.012	
I/B/E/S Expected ROA	.941	.074	
I/B/E/S Expected Growth	-.039	.539	
Z-Score	.643	.158	
Realized Future ROA	.946	-.070	
Market-to-Book Ratio	.646	-.033	
Percent of variance explained	78.1	21.9	

^a Factors are estimated using principal factor analysis with an oblique promax rotation. Variable definitions are provided in table 2.

more important. We use the four variables with high loadings on this factor to proxy for H2 in the regression analysis.²¹

Table 4 contains OLS regressions that attempt to explain cross-sectional variation in the level of the valuation allowance.²² These regressions include independent variables that proxy for the three tax hypotheses, along with variables that proxy for earnings management incentives under the leverage hypothesis. We report separate results for each of the three event years.

We first report results from a regression that tests the tax hypotheses. This regression includes the net deferred taxes variable (H1), the carryforwards variable (H3), as well as four variables that proxy for managers' expectations of future taxable income (H2): average past ROA, realized future ROA, the Z-score, and I/B/E/S ROA forecasts. The results of these regressions support all three hypotheses. First, consistent with H1, the coefficient on

²¹ We do not include the factor scores in the regression for two reasons. First, retaining the H2 proxy variables directly in the regression facilitates economic interpretation of the results. Second, as discussed by Steiger and Schonemann (1978), factor scores are indeterminate, resulting in an infinite number of "correct" solutions. Thus, although we use factor analysis as an exploratory technique to identify the underlying construct, we do not attempt to attach meaning to indeterminate factor scores. As suggested by Johnson and Wichern (1992), we perform the factor analysis using multiple rotations and find that the same variables consistently load on the first factor. Thus, although the factors scores are indeterminate, the underlying variables are robust.

²² For these regressions we examine outliers identified using the procedures that Belsley et al. (1980, 27-30) describe and are unable to identify any unduly influential observations.

TABLE 4
OLS Regressions of the Level of the Valuation Allowance Deflated by Deferred Tax Assets
on Measures of the Tax and Earnings Management Hypotheses

Event Year	Obs.	Intercept	$(DTA-DTL)/DTA$	Average Past ROA	Realized Future ROA	Z-Score	I/B/E/S Expected ROA	Carry- forwards/ DTA	Leverage	Adjusted R ²
		?	+	-	-	-	-	+	-	
0	144	.11 (2.93)	.08 (3.47)*	-1.10 (-3.10)*	-.05 (-.15)	-.03 (-2.22)*	1.37 (2.32)	.56 (6.36)*		.417
1	136	.04 (.93)	.05 (2.19)*	-.51 (-1.98)*	-.97 (-2.86)*	-.01 (-.42)	1.99 (3.53)	.59 (7.33)*		.372
2	74	.07 (1.12)	.02 (.76)	-.21 (-.55)	-.39 (-.94)	-.01 (-.77)	.85 (1.07)	.38 (3.93)*		.214
0	144	.13 (3.04)	.07 (3.45)*	-1.05 (-2.91)*	.05 (.14)	-.03 (-2.34)*	1.13 (1.77)	.57 (6.43)*	-.02 (-.96)	.417
1	136	.05 (1.10)	.05 (2.23)*	-.51 (-1.98)*	-.92 (-2.67)*	-.01 (-.48)	1.89 (3.21)	.60 (7.32)*	-.01 (-.64)	.370
2	74	.03 (0.48)	.02 (.83)	-.18 (-.47)	-.39 (-.93)	-.01 (-.52)	.93 (1.15)	.37 (3.67)*	.03 (.75)	.208

* Statistically significant at the 5% level, one-tailed test.

Variable definitions are provided in tables 1 and 2 with the exception of leverage, which is defined as the ratio of the firm's long-term debt to common equity (#9/#60), where negative values are set to missing and values larger than five are set to five.

net deferred taxes is reliably positive at the five percent level in years 0 and 1 (it is positive but insignificant in year 2), suggesting that firms with more deferred tax assets relative to their deferred tax liabilities are less likely to be able to realize their deferred tax assets and so, appropriately, have a large valuation allowance. Next, we find that the coefficient on average past ROA is significantly negative in both years 0 and 1, and that the coefficients on realized future ROA and the Z-score are negative, with one reliably negative in year 0 and the other reliably negative in year 1.²³ None of the four H2 variables are significant in year 2. The results for years 0 and 1 support H2, indicating that better past and expected future financial performance is associated with lower levels of the allowance. Contrary to our expectations, we find that the coefficient on the I/B/E/S ROA forecast variable is reliably positive, indicating that, after controlling for realized performance, firms with better future prospects have a higher allowance.

Finally, we find that the carryforwards variable is the strongest single explainer of cross-sectional variation in the level of the valuation allowance. The coefficient on this variable is positive and highly significant in all regressions. Moreover, the coefficient on carryforwards is significant in economic terms (in the range of .4 to .6), indicating that, on average, an increase in carryforwards that represents ten percent of deferred tax assets results in an increase in the allowance of about five percent of deferred tax assets. The coefficient on the net deferred taxes variable (measured in the same units) is about one tenth as large. Overall, these regressions explain a good deal of the cross-sectional variation in the allowance, with adjusted R²s of 42 percent in year 0, 37 percent in year 1 and 21 percent in year 2 (the carryforwards variable alone explains 38 percent, 28 percent and 24 percent of the variation in these years, respectively).

The high correlation between the level of tax loss carryforwards and the allowance indicates that H3 is the most strongly supported of the three tax hypotheses. It thus seems clear that some managers look almost exclusively at the level of tax loss and tax credit carryforwards in determining the level of the allowance. For example, the level of the allowance varies greatly between firms that report carryforwards and those that do not. Firms that report carryforwards have a mean (median) allowance that represents 17.7 percent (9.0 percent) of deferred tax assets compared to 2.3 percent (0 percent) for firms with no carryforwards, differences that are highly statistically significant. In addition, 86 percent of firms with carryforwards report a valuation allowance, whereas only 26 percent of firms without carryforwards report an allowance (chi-square statistic of 71.4, which is also highly significant).²⁴

The next regression specification adds a leverage variable to proxy for managers' incentives to choose the valuation allowance to reduce debt covenant constraints. We measure leverage as the ratio of the firm's long-term debt to the book value of common equity. We expect the coefficient on this variable to be negative if managers of more highly levered firms attempt to loosen debt covenant constraints by choosing a lower level for the valuation

²³ The instability of the coefficients on these two variables is unlikely to be due to collinearity, although the correlation between them is .69. First, the same results hold (Z-score is significant in year 0 but not year 1, and conversely for future ROA) when each is included separately. Second, when we examine the collinearity diagnostics that Belsley et al. (1980) suggest, i.e., variance inflation factors and condition numbers, there is no indication of serious multicollinearity.

²⁴ Managers sometimes discuss the allowance in their firms' tax footnotes and often indicate that the allowance relates exclusively to the tax benefits attributable to tax credits and tax loss carryforwards.

allowance.²⁵ The results of these regressions (also in table 4) provide little support for the leverage hypothesis. The coefficient on leverage, although negative in years 0 and 1, is never statistically significant.

Overall, the results in this section indicate that a good deal of cross-sectional variation in the valuation allowance is explained by variables associated with the tax hypotheses, especially the level of carryforward items. We find no support for the leverage hypothesis in these tests.

Changes in the Level of the Valuation Allowance

This section reports evidence on factors that affect changes in the level of the valuation allowance. We analyze changes in the allowance for two reasons. First, the results in table 4 indicate that we can explain the allowance better in year 0 than in subsequent years. One explanation for this finding is that managers choose the allowance appropriately in year 0 but do not change the allowance after that year, which we can investigate directly by looking at changes in the allowance. Second, we cannot test for income smoothing in the levels regressions, since smoothing naturally pertains to changes in both earnings and in the allowance.

To perform the changes analysis, we compute the change in the allowance from one year to the next and deflate the change by lagged deferred tax assets. Based on the distribution of these changes (not reported in tables), it is evident that managers of many firms do not change the allowance very much from one year to the next. For example, for year 1 the mean (median) change in the allowance represents .7 percent (0 percent) of lagged deferred tax assets, and 86 firms (43 percent of the sample) do not change the dollar amount of the allowance. The 10th (90th) percentiles of the distribution indicate that changes for the middle 80 percent of the sample fall between an increase of 4 percent and a decrease of 6 percent of lagged deferred tax assets, which seems small. The numbers are similar for year 2, with 40 percent of firms maintaining the allowance at the same dollar amount as in the previous year.

There is a strong relation between the likelihood that managers set the allowance at zero and the likelihood that managers change the allowance from one year to the next. Of the 128 firms with a positive value for the allowance in year 1, 110 (86 percent) had changed the allowance from the level set in year 0. In contrast, 68 of the remaining 70 firms that set the allowance at zero in year 1 also had no allowance in year 0. The numbers are similar in year 2, and reveal a clear dichotomy in the sample—while some firms (35 percent) set the allowance at zero in year 0 and leave it there, other firms (65 percent) set a non-zero allowance and change the level each year.²⁶

We report the changes regressions in table 5. To test the tax hypotheses, we regress changes in the valuation allowance on changes in net deferred tax assets (H1), changes in average past ROA (H2), and changes in the level of tax loss carryforwards (H3). To test the leverage hypothesis, we include changes in the debt-to-equity ratio, while to proxy for

²⁵ In addition to the hypothesized earnings management effect, more highly levered firms will, on average, have larger future interest deductions, lowering their expected future taxable income. This effect suggests that the sign of the coefficient on leverage will be positive (if lower expected future taxable income results in a higher allowance) and works against the earnings management argument.

²⁶ As indicated earlier, the most striking difference between these two groups of firms is the presence or absence of tax credit and tax loss carryforwards: 85 percent of firms that report an allowance in year 0 have tax credit or tax loss carryforwards, compared to 25 percent of firms that do not report an allowance. However, there are also statistically significant differences in the levels of average past ROA, dividend growth, I/B/E/S forecasts of ROA, and the Z-score between these two sets of firms in year 0. Differences in average past ROA and the Z-score (but not the other variables) persist in years 1 and 2.

TABLE 5
OLS Regressions of Changes in the Valuation Allowance Deflated by Deferred Tax Assets on Changes
in Measures of the Tax and Earnings Management Hypotheses

Event Year	Obs.	Intercept	$[\Delta(DTA - DTL)_t] / DTA_{t-1}$	$\Delta \text{Average Past ROA}$	$(\Delta \text{Carry-forwards}) / DTA_{t-1}$	$\Delta \text{Debt} / \text{Equity}$	$\Delta \text{Adjusted ROA}$	Adjusted R^2
		?	+	-	+	-	+	
<i>Panel A: All Observations</i>								
1	173	-.01 (-1.95)*	.03 (2.64)**	-.13 (-1.05)	.22 (5.24)**	.01 (1.25)	-.02 (-.15)	.199
2	160	-.01 (-.74)	.07 (3.54)**	-.45 (-2.03)**	.37 (6.32)**	-.01 (-.64)	.11 (.66)	.326
<i>Panel B: Observations With Non-Zero Changes in Allowance</i>								
1	97	-.02 (-1.55)	.05 (2.63)**	-.19 (-.99)	.33 (4.95)**	.00 (.16)	-.23 (-.84)	.299
2	94	-.00 (-.13)	.12 (3.43)**	-.70 (-2.02)**	.42 (4.86)**	-.00 (-.19)	-.07 (-.28)	.441

* Statistically significant at the 10% level, two-tailed test.

** Statistically significant at the 5% level, one-tailed test.

Variable definitions are as follows (Compustat data item numbers are shown where applicable):

$\Delta(DTA - DTL) / DTA$ is defined as the change in deferred tax assets minus deferred tax liabilities, deflated by deferred tax assets, where these numbers are taken from the firm's tax footnote.

$\Delta \text{Average Past ROA}$ in year t represents the change in the average of ROA_{t-1} , ROA_{t-2} and ROA_{t-3} , where ROA_t is defined as $(\#18 + \#48) / \#6_{t-1}$.

$\Delta \text{Carryforwards} / DTA$ represents the change in tax loss carryforwards and credits, deflated by lagged deferred tax assets, where these numbers are taken from the firm's tax footnote.

$\Delta \text{Debt} / \text{Equity}$ is defined as the ratio of the change in the firm's long-term debt-to-common equity ($\#9 / \#60$), where negative values are set to missing and values larger than five are set to five.

$\Delta \text{Operating ROA}$ in year t is defined as $\Delta \#178 / \#6_{t-1}$.

managers' incentives to smooth earnings we include changes in operating earnings deflated by lagged total assets.²⁷ We report results for the full sample as well as for the subsample of firm/years for which changes in the allowance are non-zero. The latter likely provides a more appropriate test given the fact, noted above, that some managers set the allowance at zero initially and then leave it unchanged. We estimate and report regressions for event years 1 and 2 after deleting one outlier in each year.²⁸

The results of regressing changes in the allowance on changes in variables that proxy for the tax hypotheses are broadly consistent with those for the levels regressions, and indicate that we are able to explain a good deal of the variation in changes in the allowance. We discuss results for the full sample first. For year 1, the coefficients on the net deferred tax assets and carryforwards variables are both positive and significant at the five percent level, and the adjusted R^2 is 20 percent. None of the other variables are significant. The carryforwards variable again appears to be most important. This variable has a coefficient of .22 (the coefficient on net deferred taxes is .03), and when this variable is included by itself the R^2 is 17 percent. Results are stronger for year 2. In this year, the three tax variables all have the predicted sign and are significant at the five percent level and the adjusted R^2 increases to 33 percent. All of the coefficients are larger in absolute value than in year 1. In fact, the increase in the explanatory power of the carryforwards variable is both statistically ($t = 2.18$) and economically significant, indicating that this variable increases in relative importance from year 1 to year 2. The carryforwards variable alone explains 27 percent of the variation in changes in the allowance, accounting for most of the increase in explanatory power. Neither of the earnings management variables is significant.

The results are stronger when we exclude the no-change observations. In both years, the adjusted R^2 s increase by about 10 percent and the regression coefficients are larger and more significant. The carryforwards variables is again most important, accounting for 27 percent of the variation in year 1 and 36 percent in year 2, compared to overall adjusted R^2 s of 30 percent and 44 percent, respectively. The fact that the results become more significant when we exclude the no-change observations indicates that these observations add noise to the regressions. Once again, neither of the earnings management variables is significant.

Overall, the results of the changes tests support those for the levels regressions. We find that the three tax hypotheses are supported and that the carryforwards variable is the most important explanatory variable for changes in the valuation allowance. We again find no support for the earnings management hypotheses.

VI. CONCLUSION

This paper explores the determinants of the valuation allowance for deferred tax assets under SFAS No. 109. This account is new, and is designed to compensate for the more liberal treatment of deferred tax assets that this statement requires. Many have expressed concerns that this new provision increases managerial discretion over reported income

²⁷ We use operating earnings because it is a before-tax measure. Our operationalization of smoothing assumes that the target level for this year's operating earnings is last year's operating earnings, so that, under smoothing, an increase in operating earnings leads managers to increase the valuation allowance to smooth earnings downward, and conversely for a decrease in operating earnings.

²⁸ We identify these outliers using the procedure that Belsley et al. (1980, chap. 2) describe and verify that they should be removed by reference to these firms' annual report/form 10K filings (the problems arise because these firms are not consistent from one year to the next in how they treat components of their deferred taxes, resulting in apparent very large changes in various categories).

vis-à-vis previous statements on accounting for income taxes. We thus believe that our results are important for standard setters and practitioners, as well as for accounting researchers.²⁹

We find that the allowance varies a good deal across sample firms, consistent with managers having a relatively large amount of discretion to choose the valuation allowance. Nevertheless, consistent with the provisions of SFAS No. 109, we find that the allowance depends on managers' expectations about whether their firms will realize deferred tax assets—we find that the allowance is larger for firms with relatively more deferred tax assets and smaller for firms with higher levels of expected future taxable income. The most important explanator of the level of the valuation allowance for these firms is the level of their tax credit and tax loss carryforwards. It seems that many managers simply set the allowance based on their firms' tax loss and tax credit carryforwards, which is consistent with SFAS No. 109 because the tax law places important restrictions on the extent to which these types of tax benefits can be realized.

We also find that managers tend to set the allowance in either of two, virtually mutually exclusive, ways. Managers of many sample firms (35 percent) set the allowance at zero initially and then leave the allowance unchanged in subsequent years. Conversely, managers of the remaining sample firms set the allowance at positive levels initially and then change the allowance from one year to the next. The difference between these two groups of firms principally relates to whether their deferred tax assets include carryforward items, reinforcing the importance of this variable.

We find little evidence that managers use the valuation allowance for earnings management purposes. There are two reasons to be cautious about concluding that earnings management does not affect the valuation allowance for deferred tax assets. First, our sample consists of firms whose managers likely have different incentives to manage earnings, as opposed to having a sample of firms in similar economic circumstances. Second, the valuation allowance seems most valuable as an income-smoothing device, but with only two years of post-implementation SFAS No. 109 data it is difficult to test this idea. More powerful earnings management tests await the availability of more years of data.

²⁹ Recent working papers also examine empirical aspects of deferred tax accounting under SFAS No. 109. Czekai Bauman (1997) provides evidence on cross-sectional determinants of the valuation allowance, concentrating on agency explanations. Visvanathan (1997) provides evidence on determinants of the valuation allowance and its value relevance, focusing more heavily on the latter. Amir and Sougiannis (1997) discuss information that the valuation allowance conveys to investors as part of a broader investigation of the value relevance of deferred tax accounting numbers.

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The Relation Between Nonrecurring Accounting Transactions and CEO Cash Compensation

Jennifer J. Gaver

Kenneth M. Gaver

University of Georgia

ABSTRACT: This study investigates the role of alternative earnings components in the CEO cash compensation function. We find that cash compensation is significantly positively related to above the line earnings, as long as results are positive. Compensation is shielded from the effects of above the line losses. Similarly, nonrecurring transactions that increase income flow through to compensation, but nonrecurring losses do not. This effect is noted for gains and losses that arise both from extraordinary transactions, discontinued operations and nonrecurring items that do not qualify for below the line presentation. Thus, the data tell a remarkably consistent story: gains flow through to compensation, but losses do not. The classification of the gain or loss on the income statement is of relatively little importance.

Key Words: *Executive compensation contracts, Permanent vs. transitory earnings, Extraordinary items, Discontinued operations.*

Data Availability: *A list of sample firms is available from the authors and all other data are available from public sources identified in the text.*

I. INTRODUCTION

Prior research documents a strong empirical relation between executive compensation and contemporaneous accounting performance (see, for example, Lambert and Larcker 1987; Healy et al. 1987; Defeo et al. 1989; Sloan 1993; Dechow et al. 1994;

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Natarajan 1996; Baber et al. 1997). Sloan (1993, 56) argues that accounting performance measures are used in compensation contracts to shield executives from market-wide fluctuations in firm value that are beyond their control. Early studies examine the association between compensation and aggregate accounting performance measures, such as net income (Defeo et al. 1989), or return on equity (Lambert and Larcker 1987). Banker and Datar (1989) explain that the demand for aggregation arises because basing pay on the myriad of underlying transactions that comprise net income is costly and impractical. More recently, however, Natarajan (1996) has argued that shareholders use components of earnings (such as cash flow measures) as a basis for contracting when these components provide information about the manager's action that goes beyond the bottom line result. The investigation of the degree to which components of earnings are informative about managerial actions, and therefore priced in the managerial labor market, parallels the inquiry into the role of cash flows and accruals in firm valuation (Rayburn 1986; Wilson 1986; Bernard and Stober 1989; Dechow 1994).

Natarajan (1996) focuses on the degree to which components of earnings are used in optimal compensation contracts. A closely related line of research asks whether certain transactions are removed from the earnings number for the purposes of managerial performance evaluation. For example, some transactions have a greater potential for managerial manipulation than others, and are therefore likely to be less useful for performance evaluation (Dechow et al. 1994, 140). Other items are the result of exogenous events, such as those related to mandatory changes in accounting principles (Kren and Leauby 1997). Transactions also vary in terms of their implications for sustainable firm value. Baber et al. (1997) contend that transitory events receive less weight in pay determination in order to focus the executive's attention on activities that increase permanent earnings. More generally, Clinch and Magliolo (1993) observe that components of earnings relate differently to CEO performance, and therefore will not enter into the compensation function identically.

In theory, any observable transaction can be included in the terms of managerial compensation contracts. In practice, however, it is not clear that boards of directors go to the trouble of tailoring bottom line earnings for contracting purposes. Empirical research on this question has produced conflicting results. Abdel-khalik (1985) reports that managers are not penalized for the income-decreasing effects of a switch to the LIFO method of inventory valuation. Healy et al. (1987) find just the opposite result. Dechow et al. (1994) document that CEOs' cash compensation is shielded from the negative effects of restructuring charges. However, Defeo et al. (1989) find that accounting gains associated with equity-for-debt swaps receive no special treatment in the compensation function. Healy et al. (1987) report that after a switch from accelerated to straight-line depreciation, CEO salary and bonus payments are based on reported earnings, rather than earnings re-computed using the original methods. In contrast, Kren and Leauby (1997) find that executive compensation is shielded from the income-decreasing effects of SFAS No. 106.

Thus, after more than a decade of research, the question of whether compensation committees systematically look beyond the bottom line in setting executive pay remains unanswered. Further, it is doubtful that another study of a particular accounting transaction will settle this debate. Our strategy is to step back from the details of individual transactions. Instead, we concentrate on a very simple partition of net income: "above the line" vs. "below the line" items, where below the line items are defined as the results of discontinued operations and extraordinary items.¹ We contend that if distinctions are not made at this

¹ A third below the line item, the cumulative effect of a change in accounting principal, is included as part of extraordinary items in the Compustat database, which is used in the subsequent analysis.

very general level, then it is very unlikely that more subtle differentiations among transactions are made in evaluating managerial performance.

Our partition of income into above and below the line items can provide insight into the differential treatment of permanent and transitory earnings components in the compensation function. Smith (1993) observes that a recent theme of capital markets research is that stock prices are less sensitive to the transitory component of earnings than they are to permanent earnings.² This raises the question of whether compensation committees incorporate the stock market's distinction between permanent and transitory earnings in determining executives' pay. Baber et al. (1997) report that the weight on earnings in the compensation function is directly related to earnings persistence, which they view as evidence that earnings persistence is reflected, not only in the capital market, but also in the managerial labor market. To the extent that the above and below the line earnings partition corresponds to the true delineation of permanent and transitory earnings components, our study provides an alternative and potentially corroborating test of this proposition. Further, the fact that these transactions include both gains and losses allows us to test whether the effects of income-increasing and income-decreasing items are treated differently in performance evaluation. Dechow et al. (1994, 155) acknowledge that their study focuses only on losses, where differential treatment in the compensation function results in higher compensation for the executive. They conjecture that a much different scenario is possible for accounting gains, and call for additional research on this issue.

Most firms do not disclose the details of the compensation contracts of their top executives. However, Gaver et al. (1995) report that extraordinary items are explicitly excluded from the earnings definition used for bonus determination by only 10.5 percent of a sample of firms disclosing their bonus formula.³ The results of discontinued operations are excluded from earnings measurement by only 1.2 percent of the Gaver et al. (1995) sample. Thus, for the overwhelming majority of firms that disclose contractual information, the bonus formula specifies bottom line net income (sometimes before income taxes) as the relevant performance measure. However, the bonus formula only indicates the amount which can be transferred to a bonus pool. Actual awards to individual executives can be adjusted by the compensation committee for the effects of extraordinary items or discontinued operations, even if these items are not explicitly identified in the bonus formula.

To test for differential weights on earnings elements in the compensation function, we regress CEO cash compensation on (1) above the line earnings, (2) below the line items that increase income, and (3) below the line items that decrease income. Our sample consists of 376 large public companies with time-series data from 1970 through 1996. We estimate firm-specific regressions and then assess significance levels for the mean of the estimated parameters across sample firms.

The results indicate that cash compensation is significantly positively related to above the line earnings, as long as results are positive. Compensation is shielded from the effects of above the line losses. We find no distinction between the weights on above the line earnings (when positive) and below the line gains. Both are significantly positively related to cash compensation. The weight on below the line losses, however, is insignificantly different from zero. These conclusions apply equally to below the line items defined as

² Examples are Lipe (1986), Barth et al. (1992), Givoly and Hayn (1992), Ohlson and Penman (1992), Strong and Walker (1993), Ramakrishnan and Thomas (1995) and, most recently, Hogan and Jeter (1997). Hogan and Jeter find that the market response to earnings is stronger when restructuring charges are removed.

³ Dechow et al. (1994) note that extraordinary items are excluded from earnings in the bonus computations of only five percent of their sample.

either extraordinary items or the results of discontinued operations. We also investigate the treatment of unusual transactions that do not qualify for below the line reporting because they do not meet the definition of an extraordinary item.⁴ Although the coefficients on these transactions are significantly positive for both gains and losses, the weight on gains significantly exceeds the weight on losses.

Analysis of our data reveals that 1992 and 1993 are unusual years, with roughly half of our sample firms reporting below the line items. This occurs because a large number of firms were compelled to adopt SFAS No. 106 (*Employers' Accounting for Postretirement Benefits other than Pensions*) in those years. We reestimate our models with 1992 and 1993 data omitted, and find that our inferences from the full data set generally stand. The only modification is that the weight on above the line unusual losses becomes insignificant. We also reestimate our compensation regressions for the subset of firms with a single CEO, since the weights on earnings elements could exhibit within-firm variance for firms with multiple CEOs during the time period investigated. The results are qualitatively identical to those for the full sample.

Thus, the data tell a remarkably consistent story: gains flow through to compensation, but losses do not. The position of the transaction on the income statement is of relatively little importance. If above vs. below the line disclosure conveys information about the effect of the item on permanent earnings, the results suggest that this distinction is not emphasized in compensation decisions. Although this favorable (to the executive) state of affairs could stem from managerial entrenchment, an alternative explanation for shielding CEO compensation from the effect of losses is that the board wishes to avoid penalizing managers for engaging in activities that result in current period losses, yet improve the long-term prospects of the firm (such as abandoning unprofitable operations). This, of course, does not explain why transitory gains should be weighted as heavily as the more persistent income from core operations. However, the observed compensation strategy might still be a rational response to competitive conditions in the managerial labor market if it increases the firm's ability to attract and retain top managerial talent.

The remainder of the study is organized as follows. In section II, we delineate our method for testing the hypothesis that above and below the line earnings components receive differential treatment in the compensation function. We describe the sample and data in section III. We present our results in section IV, and provide a summary and discussion of the results in section V.

II. METHOD

The study investigates the relation between accounting earnings and the cash compensation of corporate CEOs. We focus on the CEO for three reasons. First, the CEO has overall responsibility for the performance of the firm and any distinction between permanent and transitory components of earnings is most likely to be made at this level. Second, compensation data is relatively accessible for the CEO from *Forbes* surveys and through proxy statements filed with the SEC. Third, most prior studies have also focused on CEO compensation, which facilitates comparison of our results to those of other studies in the literature.

Cash compensation, defined as base salary plus annual bonus, excludes several components of compensation, such as stock option compensation and long-term performance awards that are contingent on earnings. However, previous researchers (such as, Murphy

⁴ These transactions are aggregated and reported as "special items" by Compustat (data item 17).

1985; Lambert and Larcker 1987; Defeo et al. 1989) observe that cash compensation represents a material portion of a CEO's yearly compensation.⁵ Additionally, bonus plans typically specify annual earnings as the relevant performance measure, whereas other forms of compensation do not. Thus, it is likely that cash compensation will be more sensitive to annual accounting numbers than other forms of compensation (Lambert and Larcker 1987; Sloan 1993).⁶ Finally, and especially relevant to this study, Baber et al. (1997) report that earnings persistence significantly influences CEO cash compensation, but is not significantly related to the level of stock-based compensation components.

To assess the impact of alternative earnings elements on CEO cash compensation, we estimate the following model:

$$\text{COMP}_{it} = \alpha + \beta_1 \text{INCBED}_{it} + \beta_2 \text{INCBED}_{-it} + \lambda_1 \text{NRGAINS}_{it} + \lambda_2 \text{NRLOSSES}_{it} + \varepsilon_{it} \quad (1)$$

where:

COMP_{it} = the case compensation (salary and bonus) of the CEO of firm i in year t , in inflation-adjusted dollars;

INCBED_{it} = earnings before extraordinary items and the results of discontinued operations for firm i in year t , in inflation-adjusted dollars;

INCBED_{-it} = earnings before extraordinary items and the results of discontinued operations for firm i in year t (in inflation-adjusted dollars) if the amount is negative, and zero otherwise⁷;

NRGAINS_{it} = the sum of extraordinary items and the results of discontinued operations reported by firm i in year t , if the combined amount is positive (zero if no nonrecurring items are reported, or if the sum is negative), in inflation-adjusted dollars;

NRLOSSES_{it} = the sum of extraordinary items and the results of discontinued operations reported by firm i in year t , if the combined amount is negative (zero if no nonrecurring items are reported, or if the sum is positive), in inflation-adjusted dollars.

Equation (1) provides insight into the disparate weighting of above the line (INCBED, INCBED-) and below the line (NRGAINS, NRLOSSES) earnings components, allowing for differential treatment of gains and losses. The results of prior research (for example, Healy et al. 1987; Dechow et al. 1994; Natarajan 1996) indicate that β_1 , the weight on above the line earnings, will be positive and highly significant. The coefficient on INCBED-, β_2 , indicates how the relation between cash compensation and above the line earnings is altered in loss years. A significantly negative coefficient, for example, would

⁵ Defeo et al. (1989) report that cash compensation typically represents between 70 and 80 percent of total annual CEO compensation. Lambert and Larcker (1987) estimate that salary and bonus account for between 80 and 90 percent of total compensation.

⁶ Although performance plans are also based on accounting results, performance is measured over a multiple-year period. This will have the effect of naturally dampening the effect of nonrecurring items occurring in a single year. Thus, it will be less likely that compensation committees will go to the trouble of excluding these items from the measurement of earnings for the purpose of determining performance awards.

⁷ The variable INCBED- is equivalent to the product of a dummy variable which takes on the value of one when earnings before extraordinary items is negative and is zero otherwise, and the variable INCBED. INCBED- is included in the model because the relation between CEO cash compensation and earnings is expected to differ in years when net income is positive vs. loss years.

indicate a material dampening of the effect. The distinction between above and below the line earnings components is assessed by comparing the slope coefficients for nonrecurring items (λ_1 and λ_2) to β_1 . Under the null hypothesis that no distinction is made between permanent and transitory components of earnings, λ_1 and λ_2 are expected to be positive and at least as large as β_1 . Coefficients on nonrecurring items which are positive, but significantly lower than β_1 indicate that compensation is partially insulated from transitory items. Finally, coefficients on nonrecurring items that are insignificantly different from zero indicate that these transactions are completely removed from earnings for the purpose of setting CEO cash compensation.⁸

We estimate equation (1) using firm-specific, time-series regressions. This approach is consistent with Antle and Smith (1985), Lambert and Larcker (1987), Healy et al. (1987), Defeo et al. (1989), Dechow et al. (1994) and Natarajan (1996). Firm-specific, rather than cross-sectional, regressions are used because prior research suggests that parameters of compensation regressions vary considerably across firms. Additionally, Murphy (1985) contends that cross-sectional regressions of compensation on performance are misspecified because they omit executive-specific factors that influence compensation. Dechow et al. (1994) observe that regressions of compensation on earnings using ordinary least squares techniques can result in serially correlated residuals. To eliminate any serial dependence in the residuals, we employ the two-step full transform method used by Natarajan (1996).⁹ We compute t-statistics for each parameter in equation (1) for each sample firm. The t-statistics are then aggregated across sample firms to form a z-statistic for each parameter, in the manner described by Dechow et al. (1994, 149–150). The z-statistics, which are distributed asymptotically as standard normal variates, are used to assess statistical significance.¹⁰

III. SAMPLE AND DATA

Our sample consists of 376 firms which are represented in the *Forbes* annual CEO compensation surveys. *Forbes* reports salary and bonus data (obtained from the firm's proxy statement) for CEOs of firms in any of their top 500 listings (top 500 in terms of assets, sales, market value or net income). We examine surveys beginning in 1971 (reporting 1970 data) and ending in 1997 (reporting 1996 data). Thus, there is a maximum of 27 years of compensation data available for each firm. Each annual survey covers between 737 and 850 firms and there is considerable overlap in the identities of the firms surveyed from year to year.

We require a minimum of 15 years of compensation data for a firm to be included in our sample. Additionally, the firm must report at least one nonrecurring item during its compensation time series, and have the data on Compustat necessary to estimate equation

⁸ These predictions parallel the discussion in Dechow et al. (1994, 142). Dechow et al. (1994) find that the weight on restructuring charges is significantly *negative*. This suggests that compensation committees go beyond shielding executives from a decrease in pay associated with these losses; CEO cash compensation actually increases when restructuring charges are reported.

⁹ Natarajan (1996) indicates that the two-step full transform method is superior to the Cochrane-Orcutt procedure for eliminating residual dependence because no observations are lost in differencing. However, our results are similar with and without the full transform adjustment. This is also the case in Healy et al. (1987) and Defeo et al. (1989), where the Cochrane-Orcutt procedure is used.

¹⁰ The formula for computing the z-statistics is given in table 4. Our calculation of the z-statistic assumes that the correlation among the firms' t-statistic is zero (i.e., $\bar{r} = 0$). Our justification for this assumption is that the mean of the 90,500 pairwise residual correlations from the 376 firm regressions is 0.134, indicating that the degree of cross-equation correlation is low. Fewer than 15 percent of the pairwise correlations differ significantly from zero at the 0.05 level. Average correlation p-value is 0.413.

(1).¹¹ This leaves us with 376 firms and 8,049 firm-years available for analysis. The mean and median number of years of compensation data for the firms in our sample is 21.4 years and 22 years, respectively.¹² Firms reported a mean (median) of 2.6 (2) nonrecurring gains during their compensation time series. The corresponding mean and median for nonrecurring losses are 2.3 (2). We also note the identity of the firm's CEO in each year, as reported by *Forbes*. Sample firms had a mean (median) of 5.7 (5) CEOs during the time period analyzed.

Earnings information and other descriptive financial data for sample firms are obtained from Compustat. The variable INCBED is Compustat data item 18 (earnings before extraordinary items and discontinued operations). The variable INCBED- takes on the value of INCBED in loss years, and is zero otherwise. To construct NRGAINS and NRLOSSES, we add Compustat data items 192 (extraordinary items) and 66 (discontinued operations). NRGAINS is the sum of these items if positive, and is zero otherwise. Conversely, NRLOSSES is the sum of these items if negative, and is zero otherwise. All compensation and earnings data are converted to constant dollars using a CPI adjustment.¹³

An analysis of the sample by two-digit SIC codes reveals that virtually all industries are included in the sample. The highest concentrations of sample firms are in the electrical and natural gas industry (53 firms, 14.1 percent of sample), the chemical industry (38 firms, 10.1 percent of sample), the insurance industry (24 firms, 6.4 percent of sample), and the food industry (21 firms, 5.6 percent of sample). Not surprisingly, sample firms are large. We compute the mean asset size (Compustat data item 6) in inflation-adjusted (1982–1984) dollars for each firm in the sample across the time series of years analyzed for that firm. The grand mean for the sample is \$7.213 billion, which places sample firms in the ninth decile of the asset distribution for all Compustat firms in 1983. Similarly, we compute the mean return on assets for each firm in the sample across the time series of years analyzed for that firm. The grand mean for the sample is 5.5 percent, which places sample firms in the fifth decile of the ROA distribution for all Compustat firms in 1983.¹⁴

As reported in the last line of table 1, analysis of the earnings data reveals that nonrecurring items (extraordinary items or discontinued operations) occur in 23 percent of all firm-years. The bulk of these are extraordinary items. For our sample, the incidence of nonrecurring items has steadily increased from relatively low levels (about 12 percent) in the mid-seventies. The highest rates occur in 1992 and 1993, when just over half of the 517 firm-year observations include below the line earnings components. However, this phenomenon does not persist into the most recent sample years, with only about 22 percent

¹¹ To construct the sample, we begin with the 1983 *Forbes* survey, which is the midpoint of the sample period. We identify an initial sample of 743 firms with at least ten years of (not necessarily consecutive) compensation data by visually examining surveys before and after 1983. This process is complicated by the fact that the firms surveyed change from year to year due to mergers, bankruptcies, name changes and changes in firm size. To enter into the final sample, the firm must have at least 15 annual observations, representing a full year of compensation data for a single CEO. We identify 471 firms that pass this initial screen. Firms must also have nonmissing Compustat data item 18 (earnings before extraordinary items and discontinued operations) and at least one nonrecurring item during their compensation time series. This leaves us with 376 firms and 8,049 firm-years.

¹² Admittedly, this selection procedure biases our sample toward larger, more established corporations. The need for a fairly long time series of compensation data also imparts a survivorship bias to the data, and necessitates the somewhat questionable assumption that compensation practices remain stable over time. Sloan (1993, 68) (who also studies *Forbes* firms) argues that these companies constitute a significant part of the total market value of all New York Stock Exchange firms, and are therefore worth studying in their own right.

¹³ The consumer price index for all urban consumers (CPI-U), published by the Bureau of Labor Statistics, is used to convert nominal amounts to constant dollars. The base period for the CPI-U adjustment factor is 1982–1984.

¹⁴ Return on assets is defined as income before extraordinary items in fiscal year t (Compustat data item 18) divided by the total assets at the end of fiscal year t (Compustat data item six).

TABLE 1
The Incidence of Nonrecurring Earnings Items for 376 Sample Firms
(8,049 Firm-Years) Between 1970 and 1996^{a,b}

<i>Year</i>	<i>Total Number of Firms</i>	<i>Firms Reporting Nonrecurring Items</i>		<i>Firms Reporting Extraordinary Items</i>		<i>Firms Reporting Discontinued Operations</i>	
		<i>Number^c</i>	<i>Percent</i>	<i>Number^c</i>	<i>Percent</i>	<i>Number^c</i>	<i>Percent</i>
1970	263	45	17.1	42	16.0	6	2.3
1971	274	75	27.4	71	25.9	11	4.0
1972	267	59	22.1	53	19.9	16	6.0
1973	297	39	13.1	34	11.4	10	3.4
1974	309	41	13.3	26	8.4	18	5.8
1975	313	26	8.3	12	3.8	16	5.1
1976	323	31	9.6	17	5.3	16	5.0
1977	323	48	14.9	33	10.2	17	5.3
1978	330	44	13.3	29	8.8	16	4.8
1979	324	49	15.1	38	11.7	13	4.0
1980	331	55	16.6	42	12.7	15	4.5
1981	324	60	18.5	40	12.3	24	7.4
1982	344	90	26.2	65	18.9	30	8.7
1983	343	78	22.7	51	14.9	34	9.9
1984	353	84	23.8	49	13.9	40	11.3
1985	331	93	28.1	47	14.2	53	16.0
1986	332	109	32.8	77	23.2	54	16.3
1987	304	103	33.9	77	25.3	42	13.8
1988	297	93	31.3	63	21.2	41	13.8
1989	299	77	25.8	34	11.4	46	15.4
1990	271	51	18.8	22	8.1	34	12.5
1991	275	70	25.5	44	16.0	29	10.5
1992	263	140	53.2	135	51.3	28	10.6
1993	254	130	51.2	118	46.5	23	9.1
1994	240	58	24.2	42	17.5	24	10.0
1995	233	52	22.3	27	11.6	28	12.0
1996	232	47	20.3	19	8.2	32	13.8
Total Firm-years: 8,049		% Firm-years with Nonrecurring Items: 23.0		% Firm-years with Extraordinary Items: 16.2		% Firm-years with Discontinued Operations: 8.9	

(Continued on next page)

TABLE 1 (Continued)

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- ^a Nonrecurring earnings items are defined as the sum of extraordinary items (Compustat data item 192) and the results from discontinued operations (Compustat data item 66).
 - ^b The sample consists of 376 firms that have at least 15 years of compensation data available from *Forbes* between 1970 and 1996, and have nonmissing Compustat data item 18 (income before extraordinary items and discontinued operations) and at least one nonrecurring item during their compensation time series.
 - ^c The sum of the number of firms reporting extraordinary items and the number of firms reporting discontinued operations can exceed the number of firms reporting either type of nonrecurring item because firms can report both items in the same year.
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of sample firms reporting nonrecurring items during the 1994 through 1996 period. Further, the representation of extraordinary items and discontinued operations is roughly equal during these years.

Table 1 indicates that the bulge in below the line items noted in 1992 and 1993 is attributable to a large number of firms reporting extraordinary items in these years. However, Compustat data item 66, "extraordinary items," actually includes both extraordinary items *per se*, and the cumulative earnings effect of changes in accounting principles. Analysis of footnote disclosures for sample firms in 1992 and 1993 reveals that compliance with SFAS No. 106 (*Employers' Accounting for Postretirement Benefits other than Pensions*) is the reason for the dramatic increase in below the line items reported in these years. Since 1992 and 1993 are somewhat atypical years, we estimate equation (1) using both the full data set, and also after omitting observations from 1992 and 1993.

In table 2, income-increasing and income-decreasing nonrecurring items are analyzed separately. The sample medians, reported in the last row of the table, indicate that income-increasing items tend to be somewhat smaller (in absolute value) than income-decreasing items. The median inflation-adjusted amount of income-increasing nonrecurring items shows a general increase over the sample period, with the smallest median amount reported in 1970 (\$2,835,000) and the largest median amount reported in 1996 (\$84,130,000). Although the absolute magnitude of the income-decreasing nonrecurring items varies across sample years, the largest write-offs tend to occur later in the time frame. Again, 1992 and 1993 are notable years, with 112 firms reporting income-decreasing nonrecurring items with a median of -\$87,803,000 in 1992, and 80 firms reporting income-decreasing nonrecurring items with a median of -\$49,856,000 in 1993.¹⁵ Both income-increasing and income-decreasing nonrecurring items have a significant impact on net income, with a median ratio of income increasing (decreasing) nonrecurring items to earnings before nonrecurring items of 11 percent (13 percent).¹⁶

We compute the mean CEO cash compensation, in inflation-adjusted dollars, for each firm in the sample across the time series of years analyzed for that firm. The grand mean for the total sample is \$622,578. The distribution of mean cash compensation for sample firms ranges from a low of \$83,452 (paid by Berkshire Hathaway) to a high of \$2,558,786 (paid by Walt Disney). For comparison, Fox (1985) reports that the median salary and bonus payment made to CEOs in a broad survey of manufacturing companies in 1983 is

¹⁵ Again, these amounts are largely attributable to charges related to the adoption of SFAS No. 106 for the accounting for post-employment benefits other than pensions.

¹⁶ To compute these ratios, only observations where earnings before nonrecurring items is positive are used.

TABLE 2
Analysis of Income-Increasing and Income-Decreasing Nonrecurring Earnings Items (1970-1996)
376 Sample Firms (8,049 Firm-Years) Between 1970 and 1996^{a,b}

<i>Year</i>	<i>Income-Increasing NRI</i>		<i>Income-Decreasing NR</i>	
	<i>Median Dollar Amount^c (Number of Firms)^d</i>	<i>Median % of Earnings before NRI^e</i>	<i>Median Dollar Amount^f (Number of Firms)^d</i>	<i>Median % of Earnings before NRI^e</i>
1970	\$ 2,835 (25)	5.36	\$ -20,389 (20)	-
1971	3,630 (38)	5.11	-16,691 (37)	-
1972	4,529 (25)	3.25	-7,864 (34)	-
1973	10,770 (27)	8.00	-8,336 (12)	-
1974	6,180 (22)	9.25	-12,556 (19)	-
1975	4,414 (12)	3.40	-14,329 (14)	-
1976	6,945 (23)	4.90	-6,131 (8)	-
1977	8,581 (33)	7.66	-6,639 (15)	-
1978	13,777 (24)	8.42	-6,663 (20)	-
1979	15,326 (39)	8.09	-14,939 (10)	-
1980	16,930 (30)	9.72	-10,671 (25)	-
1981	15,313 (35)	9.59	-10,644 (25)	-
1982	15,212 (52)	11.48	-21,885 (38)	-
1983	16,240 (48)	13.80	-10,205 (30)	-
1984	18,479 (47)	19.08	-25,863 (37)	-
1985	27,033 (56)	15.51	-54,237 (37)	-
1986	48,582 (64)	36.72	-14,142 (45)	-
1987	26,668 (72)	14.07	-13,204 (31)	-
1988	28,751 (69)	13.10	-23,352 (24)	-
1989	20,161 (51)	12.35	-16,844 (26)	-
1990	14,767 (33)	13.97	-17,069 (18)	-
1991	13,502 (26)	15.81	-22,944 (44)	-
1992	25,509 (28)	10.60	-87,803 (112)	-
1993	24,913 (50)	10.31	-49,856 (80)	-
1994	21,636 (17)	16.88	-7,085 (41)	-
1995	48,556 (19)	44.54	-19,423 (33)	-
1996	84,130 (23)	16.35	-11,887 (24)	-
Sample Median:	\$ 16,329 ^f (988)	10.98 ^g	\$ -20,985 ^f (859)	-

(Continued on next page)

TABLE 2 (Continued)

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- ^a Nonrecurring earnings items are defined as the sum of extraordinary items (Compustat data item 192) and the results from discontinued operations (Compustat data item 66).
 - ^b The sample consists of 376 firms that have at least 15 years of compensation data available from *Forbes* between 1970 and 1996, and have nonmissing Compustat data item 18 (income before extraordinary items and discontinued operations) and at least one nonrecurring item during their compensation time series.
 - ^c All amounts are in thousands of dollars and are adjusted to 1982–1984 constant dollars using the consumer price index.
 - ^d The number of firms in each sample year that reported income increasing (decreasing) nonrecurring earnings items is reported in parentheses.
 - ^e Earnings before nonrecurring items is Compustat data item 18. The cross-sectional median of the ratio of nonrecurring items to earnings before nonrecurring items (expressed as a percent) is reported for each year in the sample period. The ratio is only calculated for firm-years where earnings before nonrecurring items is positive.
 - ^f The median inflation-adjusted reported nonrecurring gain (loss) for the 988 (859) firm-years where a gain (loss) is reported.
 - ^g The median ratio of nonrecurring gain (loss) to earnings before nonrecurring items for all firm-years where a gain (loss) is reported. The ratio is only calculated for firm-years where earnings before nonrecurring items is positive.
-

\$408,000.¹⁷ Additional summary statistics for the average annual CEO cash compensation and corporate earnings data across sample firms are reported in table 3.¹⁸

IV. RESULTS

To investigate whether above and below the line earnings components receive differential treatment in the compensation function, we estimate equation (1) for each firm in the sample. Table 4 reports descriptive statistics for the cross-sectional distributions of the estimated regression parameters. Panel A presents results for the case where nonrecurring items are defined as the sum of extraordinary items and discontinued operations. The z-statistic of 53.82 associated with the coefficient on INCBED indicates that, as expected, CEO cash compensation is significantly positively related to above the line earnings. Additionally, the significantly negative average coefficient on INCBED- (z-statistic of -13.93) means that the normally positive association between cash compensation and above the line earnings is significantly reduced in loss years. Comparison of median coefficients on INCBED (1.15) and INCBED- (-1.06) shows that the relation is essentially nullified when above the line earnings are negative. In fact, the average sum of the estimated β_1 and β_2 coefficients (not reported in table 4) is -1.54, with an associated z-statistic of -6.32. This suggests that the function relating CEO cash compensation to above the line earnings is kinked at zero, with compensation actually increasing in losses.¹⁹

The average coefficient on nonrecurring gains, λ_1 , is positive and the associated z-statistic of 9.11 indicates that the result is highly significant. No significant difference is

¹⁷ The median salary and bonus payments to CEOs in the utilities, banking and insurance industries in 1983 are \$228,000, \$220,000 and \$222,000, respectively.

¹⁸ The mean value for salary and bonus compensation of \$634,961 reported in table 3 is a simple mean which weights all firm-year observations equally. The grand mean of \$622,578 reported in the text is a cross-sectional mean of the firm time-series averages.

¹⁹ To investigate this anomalous result, we include a dummy variable to allow for a change in fixed salary in loss years. The coefficient on the loss dummy is insignificantly different from zero, indicating that, on average, fixed salary remains unchanged when a loss occurs. Additionally, the modified specification nullifies the apparent rewards for incurring losses. When the dummy variable is added, the sum of the coefficients on INCBED and INCBED- becomes insignificantly different from zero. In our opinion, the conclusion that compensation is increasing in losses cannot be reliably inferred from the data.

TABLE 3
Summary Statistics for Annual CEO Cash Salary and Bonus Payments, Earnings Before Nonrecurring Items, and Income-Increasing and Income-Decreasing Nonrecurring Earnings Items Made by 376 Sample Firms Between 1970 and 1996^{a,b}

<i>Variable</i>	<i>Firm-Years^c</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>First Quartile</i>	<i>Median</i>	<i>Third Quartile</i>
Salary and bonus ^d	8,049	\$634,961	\$441,690	\$375,254	\$545,455	\$773,196
Earnings before nonrecurring items ^e	8,049	259,317	567,339	66,770	132,828	263,636
Income-Increasing NRI ^f	988	53,567	141,959	5,122	16,329	48,530
Income-Decreasing NRI ^f	859	-102,506	387,702	-73,358	-20,985	-5,904
Extraord. Gains ^g	702	44,442	137,530	4,331	14,830	35,690
Extraord. Losses ^g	605	-116,065	455,100	-67,128	-18,532	-5,477
Income-Increasing Disc. Ops. ^h	372	68,277	143,117	5,762	17,751	64,196
Income-Decreasing Disc. Ops. ^h	344	-62,846	118,408	-68,748	-21,554	-7,261

^a The sample consists of 376 firms that have at least 15 years of compensation data available from *Forbes* between 1970 and 1996, and have nonmissing Compustat data item 18 (income before extraordinary items and discontinued operations) and at least one nonrecurring item during their compensation time series.

^b All amounts are adjusted to 1982-1984 constant dollars using the consumer price index.

^c The number of firm-year observations used to compute the summary statistics.

^d Cash salary and bonus data for the CEO are obtained from annual *Forbes* surveys.

^e Earnings before nonrecurring items is Compustat data item 18. Amounts are in thousands.

^f Nonrecurring earnings items (NRI) are defined as the sum of extraordinary items (Compustat data item 192) and the results from discontinued operations (Compustat data item 66). Amounts are in thousands.

^g Compustat data item 192. Amounts are in thousands.

^h Compustat data item 66. Amounts are in thousands.

detected between the weights on above the line earnings (β_1) and nonrecurring gains (λ_1). The implication is that nonrecurring gains flow completely through to compensation. In contrast, the average coefficient on nonrecurring losses (λ_2) is insignificantly different from zero (z-statistic of -1.41). This suggests that nonrecurring losses are removed from the earnings number used to determine CEO cash compensation. Tests of differences indicate that the weights on both above the line earnings (β_1) and nonrecurring gains (λ_1) significantly exceed the weight on nonrecurring losses (λ_2).

One way to assess the economic significance to the CEO of shielding compensation from nonrecurring losses is to multiply the median inflation-adjusted nonrecurring loss for the sample (-\$20,985,000; table 2) by the median coefficient on nonrecurring gains

TABLE 4
Descriptive Statistics from 376 Firm-Specific Regressions of CEO Cash Compensation on Earnings Components^a

$$COMP_{it} = \alpha + \beta_1 INCBED_{it} + \beta_2 INCBED_{-it} + \lambda_1 NRGAINS_{it} + \lambda_2 NRLOSSES_{it} + e_{it}^b$$

Panel A: Nonrecurring Items Defined as the Sum of Extraordinary Items and the Results of Discontinued Operations

	Mean (n) ^c	z-statistic ^d	Lower Quartile	Median	Upper Quartile	Differences (n)	z-statistic
α	379.74 (376)	79.53	215.17	354.90	515.35	$\beta_1 - \lambda_1$ (318)	1.24
β_1	1.80 (376)	53.82	0.33	1.15	2.35	$\beta_1 - \lambda_2$ (302)	14.94
β_2	-2.99 (164)	-13.93	-4.54	-1.06	0.31	$\lambda_1 - \lambda_2$ (246)	5.27
λ_1	4.90 (318)	9.11	0.48	0.67	3.66		
λ_2	-1.93 (302)	-1.41	-1.39	-0.01	1.31		
Adj. R ²	0.57 (376)	—	0.39	0.58	0.74		

$$COMP_{it} = \alpha + \beta_1 INCBED_{it} + \beta_2 INCBED_{-it} + \lambda_1 EXTRAGAIN_{it} + \lambda_2 EXTRALOSS_{it} + \lambda_3 DISCGAIN_{it} + \lambda_4 DISCLOSS_{it} + e_{it}^f$$

Panel B: Extraordinary Items and the Results of Discontinued Operations Estimated Separately

	Mean (n) ^c	z-statistic ^d	Lower Quartile	Median	Upper Quartile	Differences (n)	z-statistic
α	377.86 (376)	78.57	211.28	344.84	519.17	$\beta_1 - \lambda_1$ (260)	0.82
β_1	1.79 (376)	53.20	0.34	1.14	2.30	$\beta_1 - \lambda_2$ (268)	12.04
β_2	-1.68 (164)	-12.84	-4.69	-1.06	0.34	$\beta_1 - \lambda_3$ (162)	-0.70
λ_1	-3.77 ^e (260)	4.41	-1.65	0.27	3.81	$\beta_1 - \lambda_4$ (145)	7.60
λ_2	-2.63 (268)	-1.57	-1.69	-0.06	1.61	$\lambda_1 - \lambda_2$ (179)	3.45
λ_3	3.37 (162)	8.95	-0.21	1.31	5.55	$\lambda_3 - \lambda_4$ (96)	4.48
λ_4	3.13 ^e (145)	-0.20	-1.40	0.29	2.30		
Adj. R ²	0.58 (376)	—	0.42	0.60	0.75		

(Continued on next page)

TABLE 4 (Continued)

$$COMP_{it} = \alpha + \beta_1 INCBED_{it} + \beta_2 INCBED_{-it} + \lambda_1 NRGAINS_{it} + \lambda_2 NRLOSSES_{it} \\ + \lambda_3 SPECIALGAIN_{it} + \lambda_4 SPECIALLOSS_{it} + e_{it}^g$$

Panel C: Special Items Estimated Separately

	Mean (n) ^c	z-statistic ^d	Lower Quartile	Median	Upper Quartile	Differences (n)	z-statistic
α	343.89 (376)	69.74	188.99	311.93	460.02	$\beta_1 - \lambda_1$ (318)	1.59
β_1	1.98 (376)	56.82	0.41	1.34	2.72	$\beta_1 - \lambda_2$ (302)	14.41
β_2	0.73 ^e (118)	-7.52	-2.86	-0.42	2.10	$\beta_1 - \lambda_3$ (264)	-4.63
λ_1	7.64 (318)	8.16	-0.88	0.49	3.68	$\beta_1 - \lambda_4$ (302)	18.14
λ_2	-2.35 (302)	-0.26	-1.25	0.07	1.63	$\lambda_1 - \lambda_2$ (249)	4.50
λ_3	4.75 (264)	13.92	-0.02	1.51	4.95	$\lambda_3 - \lambda_4$ (234)	7.37
λ_4	-0.93 ^e (304)	3.96	-0.96	0.17	1.11		
Adj. R ²	0.63 (376)	—	0.47	0.65	0.81		

* The sample consists of 376 firms that have at least 15 years of compensation data available from *Forbes* between 1970 and 1996, and have nonmissing Compustat data item 18 (income before extraordinary items and discontinued operations) and at least one nonrecurring item during their compensation time series.

^b Variables used in this model are defined as follows:

$COMP_{it}$ = the cash compensation (salary and bonus) of the CEO of firm i in year t , in inflation-adjusted dollars.

$INCBED_{it}$ = earnings before extraordinary items (Compustat data item 192) and the results of discontinued operations (Compustat data item 6C) for firm i in year t , in inflation-adjusted dollars.

$INCBED_{-it}$ = earnings before extraordinary items and the results of discontinued operations for firm i in year t (in inflation-adjusted dollars) if the amount is negative, and zero otherwise.

$NRGAINS_{it}$ = the sum of extraordinary items and the results of discontinued operations reported by firm i in year t , if the combined amount is positive (zero if no nonrecurring items are reported, or if the sum is negative), in inflation-adjusted dollars.

$NRLOSSES_{it}$ = the sum of extraordinary items and the results of discontinued operations reported by firm i in year t , if the combined amount is negative (zero if no nonrecurring items are reported, or if the sum is positive), in inflation-adjusted dollars.

^c The number of firm-specific parameters that are used to compute the statistics.

^d The formula for calculating the z-statistic is explained by Dechow et al. (1994, 149–150). The formula is:

$$Z = \frac{1}{\sqrt{N}} \sum_{j=1}^N \frac{t_j}{\sqrt{k_j/(k_j - 2)}} / \sqrt{1 + (N - 1)r^2}$$

(Continued on next page)

TABLE 4 (Continued)

where $\bar{r}$ is the mean correlation among the sample firms' t-statistics and k_j is the degrees of freedom in the regression for firm j . The calculated z-statistics assume $\bar{r} = 0$ because the pairwise cross-equation residual correlations are generally not significantly different from zero (see footnote 10).

^e The mean parameter and associated z-statistic have differing signs due to a few firm-specific coefficients that are atypical and large in absolute value.

^f Variables used in this model are defined as follows:

EXTRAGAIN_{it} = income-increasing extraordinary items (Compustat data item 192) reported by firm i in year t , in inflation-adjusted dollars, or zero if none are reported.

EXTRALOSS_{it} = income-decreasing extraordinary items reported by firm i in year t , in inflation-adjusted dollars, or zero if none are reported.

DISCGAIN_{it} = the results of discontinued operations (Compustat data item 66) that increased income for firm i in year t , in inflation-adjusted dollars, or zero if none are reported.

DISCLOSS_{it} = the results of discontinued operations that decreased income for firm i in year t , in inflation-adjusted dollars, or zero if none are reported.

COMP_{it}, INCBED_{it} and INCBED_{-it} are defined as in footnote b.

^g Variables used in this model are defined as follows:

INCBED_{it} = earnings before extraordinary items (Compustat data item 192), the results of discontinued operations (Compustat data item 66), and special items (Compustat data item 17) for firm i in year t , in inflation-adjusted dollars.

INCBED_{-it} = earnings before extraordinary items, the results of discontinued operations, and special items for firm i in year t (in inflation-adjusted dollars) if the amount is negative, and zero otherwise.

SPECIALGAIN_{it} = income-increasing special items (Compustat data item 17) for firm i in year t , in inflation-adjusted dollars, or zero if none are reported.

SPECIALLOSS_{it} = income-decreasing special items for firm i in year t , in inflation-adjusted dollars, or zero if none are reported.

COMP_{it}, NRGAINS_{it} and NRLOSSES_{it} are defined as in footnote b.

(0.00067; table 4, panel A).²⁰ This amount represents the median decrease in cash compensation that would be experienced by the CEO if nonrecurring losses and nonrecurring gains were afforded identical treatment. The result, $-\$14,060$, is only 2.6 percent of median CEO cash compensation ($\$545,455$; table 3), which does not appear to be a particularly material amount. On the other hand, the product of the *mean* nonrecurring loss for the sample ($-\$102,506,000$; table 3) and the *mean* coefficient on nonrecurring gains (.00490; table 4, panel A) is $-\$502,279$, which is 79 percent of average CEO cash compensation ($\$634,961$; table 3). Thus, the policy of shielding CEO pay from nonrecurring losses appears to represent an economically meaningful degree of protection for some executives.

The regression results reported in panel A are based on equation (1), which combines extraordinary items and the results of discontinued operations into an aggregate measure of nonrecurring transactions. We dissect this result by estimating equation (2), which allows extraordinary items and discontinued operations (divided into gains and losses) to have unique slope coefficients.

$$\begin{aligned} \text{COMP}_{it} = & \alpha + \beta_1 \text{INCBED}_{it} + \beta_2 \text{INCBED}_{-it} + \lambda_1 \text{EXTRAGAIN}_{it} \\ & + \lambda_2 \text{EXTRALOSS}_{it} + \lambda_3 \text{DISCGAIN}_{it} + \lambda_4 \text{DISCLOSS}_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

The variables COMP, INCBED and INCBED₋ are all defined as in equation (1);

²⁰ The median coefficient of 0.67 reported in table 4 is obtained when earnings items are reported in thousands of dollars. The appropriate multiplier for nonrecurring losses in dollars is therefore 0.00067.

EXTRAGAIN and EXTRALOSS are income-increasing and income-decreasing extraordinary items, respectively; and DISCGAIN and DISCLOSS are the results of discontinued operations, also separated according to their directional effect on income.

The results of estimating equation (2) for the 376 sample firms, reported in panel B of table 4, echo the aggregate results presented in panel A. Gains, both from extraordinary items and discontinued operations, flow through to CEO cash compensation, but losses do not. The *z*-statistic on λ_1 , the slope coefficient on extraordinary gains is 4.41, and the *z*-statistic on λ_3 , the slope coefficient on income-increasing discontinued operations is 8.95. In contrast, the slope coefficients on extraordinary losses and income-decreasing discontinued operations are insignificantly different from zero (*z*-statistics of -1.57 and -0.20 , respectively). No significant difference is detected between the weight on above the line earnings (β_1) and the weights on below the line gains (λ_1 and λ_3). However, the weight on above the line earnings significantly exceeds the weights on below the line losses (λ_2 and λ_4). Likewise, the weights on below the line gains exceed the weights on below the line losses.

In equations (1) and (2) we assume that the above and below the line income statement dichotomy appropriately classifies recurring and nonrecurring earnings elements. However, we recognize that above the line earnings includes some transactions that are not necessarily expected to recur. Items which are unusual, but do not meet the requirements for below the line disclosure, are classified as special items by Compustat (data item 17).²¹ To investigate the treatment of these transactions, we estimate equation (3).

$$\begin{aligned} \text{COMP}_{it} = & \alpha + \beta_1 \text{INCBED}_{it} + \beta_2 \text{INCBED}_{-it} + \lambda_1 \text{NRGAINS}_{it} + \lambda_2 \text{NRLOSSES}_{it} \\ & + \lambda_3 \text{SPECIALGAIN}_{it} + \lambda_4 \text{SPECIALLOSS}_{it} + \varepsilon_{it} \end{aligned} \quad (3)$$

In equation (3), INCBED and INCBED- are modified from their original definitions in equations (1) and (2) by removing the effects of special items. The variables NRGAINS and NRLOSSES are identical to their counterparts in equation (1): the sum of extraordinary items and the results of discontinued operations, segregated into gains and losses. The variables SPECIALGAIN and SPECIALLOSS represent Compustat special items, also classified by their effect on income.

The results of estimating equation (3) for the 376 sample firms are reported in panel C of table 4. The estimated coefficients and associated *z*-statistics on INCBED, INCBED-, NRGAINS and NRLOSSES tell a story that is consistent with that of panel A. That is, the relation between cash compensation and above the line earnings is significantly positive, although the association is significantly reduced in loss years. Nonrecurring gains flow through to compensation (the *z*-statistic on λ_1 is 8.16), but nonrecurring losses do not (the *z*-statistic on λ_2 is -0.26). The average weight on income-increasing special items is significantly positive (*z*-statistic of 13.92), indicating that the treatment of these items is similar to that afforded to extraordinary gains and discontinued operations that increase income. The weight on income-decreasing special items is also significantly positive (*z*-statistic of 3.96). This is the first evidence that losses flow through to CEO cash compensation. However, the weight on special losses (λ_4) is significantly lower than the weights both on above the line earnings (β_1) and on special gains (λ_3), indicating that at least some

²¹ For our sample, we have 879 firm-years (264 firms) where an income-increasing special item is reported, and 1,058 firm-years (304 firms) where an income-decreasing special item is reported. The mean (median) income-increasing special item is \$48,466,000 (\$16,158,000). The mean (median) income-decreasing special item is $-\$163,048,000$ ($-\$41,813,000$).

shielding takes place. When special items are removed from above the line earnings, the relation between compensation and above the line earnings becomes insignificant in loss years (the mean sum of the weights on INCBED and INCBED- is insignificant). An interpretation is that the CEO receives a fixed salary (the intercept term in our models), but no bonus compensation when performance is negative.

As discussed in section III, 1992 and 1993 are unusual because roughly half of the 517 firm-year observations in these years include below the line earnings components. Most of these relate to the adoption of SFAS No. 106. To assess the influence of these observations on our results, we reestimate the regressions in table 4, this time omitting data from 1992 and 1993. For the most part, the results are qualitatively unchanged. The only difference is in the results for equation (3). With 1992 and 1993 observations omitted, the coefficient on special losses is insignificant. Thus, the findings are unwavering; gains flow through to compensation, and losses are screened out.

As a final check, we identify 189 sample firms that had a CEO in office for at least ten years. We then reestimate equations (1) through (3), restricting the data set to observations for a single CEO for each firm. We perform this analysis because slope coefficients in compensation functions are likely to be both firm- and executive-specific. Even after this restriction, however, the results are qualitatively identical to those reported in table 4; executives profit from gains and are shielded from losses.

V. SUMMARY AND DISCUSSION

Prior research consistently documents a significantly positive relation between CEO cash compensation and reported accounting earnings. What is not well understood is how components of earnings enter into the compensation function, if at all. To address this question, we concentrate on a simple partition of net income: above the line and below the line items, where below the line items are defined as the results of discontinued operations and extraordinary items. We assume that this classification provides a rough proxy for the true delineation of the permanent and transitory components of earnings.

We conduct firm-specific regressions of CEO cash compensation on (1) above the line earnings, (2) below the line items that increase income, and (3) below the line items that decrease income. Our sample consists of 376 firms that have at least 15 years of compensation data available from *Forbes* between 1970 and 1996, have earnings data available from Compustat, and have at least one nonrecurring item during their time series of compensation and earnings data. In all, we have 8,049 firm-years available for analysis, with below the line gains or losses reported in 23.0 percent of all firm-years.

We find that cash compensation is significantly positively related to above the line earnings, as long as results are positive. Compensation is shielded from the effects of above the line losses. Similarly, below the line transactions that increase income flow through to compensation, but below the line losses do not. This effect is noted for gains and losses that arise both from extraordinary transactions and discontinued operations. Further, unusual gains that do not qualify for below the line treatment are significantly positively weighted in the compensation function. Compensation is shielded from unusual losses. Thus, the data tell an invariable story: gains flow through to compensation, but losses do not. The position of the transaction on the income statement is of relatively little importance. If above vs. below the line disclosure conveys information about the effect of the item on permanent earnings, the results suggest that this characteristic is not emphasized in compensation decisions.

Our findings indicate that compensation committees distinguish among the transactions comprising net income in determining executive pay, and these distinctions tend to favor

the executive. There are several reasons why this might occur. One possibility is that managers have superior bargaining power in compensation negotiations, perhaps because there are few close substitutes for CEOs with firm-specific knowledge and experience. Thus, a favorable contract is offered to avoid the decrement in firm value that would occur if the CEO left the firm. This argument is not entirely persuasive, however, because firms in our sample changed CEOs about once every four years, and executives can only make credible threats of quitting if their talents can be deployed in another firm. All the same, if this type of implicit contract is used by peers, the firm might be compelled to offer similar terms in order to attract and retain talented CEOs. Another explanation for the observed practice of protecting executives from nonrecurring losses and rewarding them for nonrecurring gains is that, on average, nonrecurring items reflect managerial decisions that increase the value of the firm, and managers are rewarded for these decisions. This explanation, of course, only applies to nonrecurring charges that are under the manager's control. A potential rationale for immunizing the contract from strictly exogenous losses, such as extraordinary losses associated with natural disasters, is to avoid imposing undue risk on the executive.

This study provides evidence that compensation committees look beyond bottom line earnings in setting bonus and salary awards to CEOs. Additional research, perhaps in the form of a field study, could provide additional insights into the process by which compensation is determined, and the aspects in which the types of accounting information useful for compensation contracting differ from the accounting numbers used for valuation purposes.

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Experimental Evidence of Differential Auditor Pricing and Reporting Strategies

Michael J. Calemari

Georgia State University

Jeffrey W. Schatzberg

University of Arizona and Middlesex University

Galen R. Sevcik

Georgia State University

ABSTRACT: This study tests the competitive equilibrium predictions of a multi-period model of audit pricing and independence in two sets of laboratory markets: a control set consisting of human subjects in the role of auditors contracting with robot clients, and a treatment set in which both auditors and clients are human subjects. The results in all the control-set markets and some of the treatment markets support the predictions of "lowball" pricing and that heterogeneous beliefs among auditors regarding the treatment of a client-reporting issue is a necessary condition for independence impairment. By contrast, several treatment-set markets exhibit cooperative behavior between auditors and clients to achieve jointly beneficial outcomes. This behavior deviates from the price-independence relationship predicted in the competitive equilibrium, exhibiting instead a price-independence relationship that is characterized by an absence of lowballing and frequent independence impairment, even when auditors have homogeneous beliefs.

Key Words: *Auditing, Independence, Pricing, Competitive equilibrium, Signaling, Cooperation.*

Data Availability: *The laboratory market data used in this paper are available from the authors upon request.*

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I. INTRODUCTION

The relationship between auditor pricing and independence has long been an area of concern for auditors and regulators. In particular, the audit pricing practice of "lowballing" (i.e., setting initial fees below expected current costs) has been hypothesized to create an environment conducive to impairment of independence. While many studies have examined either audit pricing or auditor independence, few in the literature have modeled the relationship between lowballing and independence. DeAngelo (1981) was the first paper to investigate auditor pricing and independence analytically. She describes lowballing as a strategic pricing decision auditors make to obtain future client-specific quasi-rents, because an incumbent auditor has transaction cost advantages over competing auditors. The incumbent auditor's cost advantages arise because new auditors bear significant start-up (learning) costs and because the client incurs switching costs. While DeAngelo (1981, 123) suggests that the existence of these quasi-rents may impair independence, she does not present an explicit model that fully characterizes this relationship.

Magee and Tseng (1990) (hereafter MT) further develop and refine DeAngelo's (1981) model by specifying conditions that must exist before an auditor might compromise independence on a multi-period reporting issue. One necessary condition is that auditors in the market disagree among themselves as to the appropriateness of a client-preferred reporting policy. By contrast, when all auditors agree on the resolution of the reporting issue, independence (i.e., an auditor truthfully reporting his resolution of the reporting issue) will not be impaired. MT derive a competitive equilibrium in which lowballing occurs under both scenarios, but independence is impaired only when there is auditor disagreement. Thus, this model specifies the impact of auditor homogeneity (agreement) vs. heterogeneity (disagreement) in reporting behavior on the price-independence relationship.

While the MT model yields price and independence predictions in a competitive market equilibrium, there is still the potential for alternative behavior not predicted in their model to arise. Specifically, under both agreement and disagreement scenarios, cooperative behavior between auditor and client may yield the following price-independence relationship: auditors offer and clients accept high (non-lowballing) premium prices, and auditors subsequently impair their independence to the benefit of the client.

The purpose of this paper is to test MT's model by conducting 16 multi-period laboratory markets partitioned along two different dimensions. First, we examine the descriptive validity of the predicted effect of heterogeneity in auditor reporting on market behavior by conducting eight markets in which auditors disagree among themselves as to the appropriate resolution of a client-reporting issue (Disagree markets), and eight markets that consist entirely of auditors who agree on the appropriate resolution of the issue (Agree markets). Second, we also assess the descriptive validity of the predicted price-independence relationship by partitioning these 16 markets into a control set of eight markets in which human subjects in the role of auditors contract with robot (computerized) clients programmed to act consistent with the model's competitive predictions, and a treatment set of eight markets in which both auditors and clients are human subjects who may pursue any type of market behavior. In both the control and treatment market sets, we set a relatively small penalty for an auditor impairing his independence (misreporting his resolution of the reporting issue) so that an incentive for cooperative behavior exists in the markets.¹

We find the robot-client markets exhibit results that are consistent with the hypothesized effect of heterogeneity in auditor reporting on market behavior, and the price-independence

¹ The term "relatively small" means that the penalty cost of misreporting is less than the expected quasi-rents that accrue to the auditor for misreporting.

relationship that is predicted by the model's competitive equilibrium. Specifically, auditors lowball under both the Agree and Disagree conditions, and impair independence only in the Disagree markets. We also find that new auditors frequently contract with the robot-clients via an undercutting strategy (pricing below costs with no opportunity for earning future quasi-rents) in an attempt to discipline incumbent auditors judged to be pricing too aggressively and/or contracting with too many clients. The effects of undercutting in the robot-client markets are not unlike the predatory pricing for auditor engagements and auditor displacement in real-world markets documented by Okell (1991).

Like the robot-client markets, the results in half of the human-client markets are consistent with MT's competitive predictions regarding lowballing and independence. These findings suggest two potential insights for real-world auditing markets. First, the effects of auditor agreement vs. disagreement on reporting behavior suggest that greater agreement among auditors regarding the interpretation and application of generally accepted accounting principles may reduce the likelihood of independence impairment by auditors. Second, the occurrence of competitive results even when the opportunity exists for auditors and clients to better themselves via cooperative behavior suggests a large penalty is not always necessary to prevent independence impairment from occurring in the market.

The results in the other half of the human-client markets exhibit systematic behavior that deviates from the competitive equilibrium and, instead, is consistent with signaling and cooperative strategies. Under both Agree and Disagree conditions in these markets, auditors signal a willingness to impair independence through high offer prices to clients. Clients commit to this strategy by accepting the high prices, and many auditors follow through by subsequently providing reports that benefit the client. Contrary to the concerns of regulators, there is evidence in these markets of independence impairment even when lowballing is absent. Thus, although the MT competitive equilibrium is often descriptive of behavior in the human-client markets, there is also substantial evidence of cooperative behavior which suggests that markets alone may be insufficient to always ensure auditor independence. In contrast to the relatively small penalty in our markets, a more significant penalty may also be required.

In addition to providing empirical insights to the analytical work of MT and DeAngelo (1981), this study offers contributions beyond other related papers, i.e., Schatzberg (1990, 1994), Dopuch and King (1996) (hereafter DK), Schatzberg and Sevcik (1994) (hereafter SS) and Schatzberg et al. (1996). Schatzberg (1990) found that transaction costs induce lowball pricing in two-period trading markets, while Schatzberg (1994) found heterogeneity in auditor reporting behavior (some auditors being exogenously endowed to report a higher value than other auditors on a client-reporting issue) could induce lowballing without transaction costs. However, neither of these two studies examined the issue of auditor independence nor its relationship to pricing.

DK examined lowballing and its effect on audit quality in a setting with transaction costs and homogeneous auditors (all auditors possess identical cost and audit-quality choices). In their model, auditors choose between a costly high-quality audit in which they observe and must report the actual value of the client's asset (either high or low), or a costless low-quality audit that allows the auditor to report either high or low for the client's asset value.² In such a setting, they found that lowballing did not materially reduce audit quality (defined as the auditor selecting low-quality more often than the level predicted in

² This audit-quality decision is related to the concept of independence because it is unlikely that auditors who prefer to report the client-preferred high asset value will perform a high-quality audit and risk observing a low valued asset that must be reported.

equilibrium), except when contracting with robot-clients under an extreme level of lowballing. While this paper provided insight into the relationship between price and quality, it is limited by the fact that pricing behavior was constrained in all but two of their markets, either by the experimenter artificially setting prices, or by conducting single-period trading markets (which precludes lowball pricing).

SS developed a model of lowballing and independence in which there are no transaction costs and heterogeneous auditors (exogenously endowed with an audit quality in which they observe either the actual or a lower value for a client's asset, and either high or low audit cost) make both a price and reporting decision. SS showed informational advantages that accrue to incumbent auditor-client pairings regarding auditor cost and quality cause lowball pricing and can impact audit independence decisions.³ In testing their model, SS found that auditors contracting with robot-clients in two-period trading markets engaged in lowballing, and impaired their independence (misreported their observed value) when future quasi-rents were in excess of the penalty cost for misreporting. These findings suggest that independence impairment is a function of the trade-off between future client-specific quasi-rents and expected penalty costs.

Schatzberg et al. (1996) presented an examination of reporting behavior in robot-client markets, consisting of several heterogeneous-auditor markets from SS and two homogeneous-auditor markets (based on the MT setting) from the current study. Their study provided exploratory evidence that common elements of the SS and MT models (i.e., the existence of future quasi-rents, potential net economic benefits to the auditor for impairment of independence, and potential variability in auditor attributes) may be necessary and sufficient conditions for aggregate independence impairment behavior. However, their study did not examine pricing behavior nor its relationship with auditor independence, and only examined independence behavior that occurred in markets with robot-clients.

The current study offers four contributions that extend the above papers in several respects. First, unlike Schatzberg (1990, 1994), Schatzberg et al. (1996), and most of the markets of DK, this study conducts laboratory markets in which auditors make both price and reporting decisions, thereby providing a more complete test of the price-independence relationship. Second, unlike DK (who examine markets with only homogeneous auditors) and SS (who examine markets with only heterogeneous auditors), this study provides evidence on how the price-independence relationship is affected by the presence of homogeneous vs. heterogeneous auditors under true *ceteris paribus* conditions by testing the MT model with auditor agreement and disagreement on the client-reporting issue as a treatment variable. This is a relevant aspect of naturally occurring audit markets because the extent to which auditors agree on the appropriate treatment of reporting issues can vary greatly across clients and issues.

Third, although both SS and MT predict a price-independence relationship in a competitive market equilibrium, only the MT modeling environment possesses the potential for alternative market behavior to occur in some contexts.⁴ Thus, by examining the descriptive

³ There are several differences between the SS and MT models, such as the underlying economic cause of quasi-rents (cross-sectional variation in audit cost and quality in SS vs. transaction cost advantages in MT), as well as auditor switching (occurring in SS but not in MT).

⁴ The potential for cooperative behavior arises in MT because the client benefit that is created by the client-preferred reporting strategy is assumed to be unaffected by any common knowledge information in the model. Although the MT two-party (auditor and client) model does not address third-party owners, the above assumption would be consistent with a three-party environment in which an owner rationally decides, due to costly contracting (e.g., costs of readjusting debt covenant agreements and compensation plans), that it is not cost-beneficial to decrease the client benefit being earned from cooperative behavior. Auditor-client cooperative behavior is not

(Continued on next page)

validity of the MT model in laboratory market settings where alternative strategies and price-independence relationships may arise, the current study extends our understanding of the price-independence relationship. Such testing of alternative strategies and their impact on the price-independence relationship has not been examined in the prior research. Finally, unlike Schatzberg (1994), SS, Schatzberg et al. (1996) and some of the DK markets, this testing of the MT model is conducted in markets where both auditors and clients are human subjects. We also conduct control markets with human-auditors and robot-clients for comparison with the treatment human-client markets. This research design yields better insights into the behavior in human-client markets and different player strategies, and sheds new light on the results of the simpler robot-client markets in the prior literature.

The rest of the paper consists of the following. Section II explains the research design and develops the related hypotheses. Section III presents and analyzes the market results. Section IV summarizes our findings and suggests possible topics for future research.

II. RESEARCH DESIGN AND HYPOTHESES

Laboratory Market Setting

Because our laboratory market setting is based on specifications of MT's model, we review it with respect to the parameters used in this study. In order to minimize the effect of any role playing by subjects, a common characteristic of laboratory market design is the replacement of model terms that are potentially suggestive and value-laden with terms that are relatively generic. For example, the terms "client," "auditor" and "auditor's report" in MT are replaced with "buyer," "seller" and "announcement," respectively, in our laboratory markets. Nevertheless, throughout the remainder of the paper we will use the MT model terms client, auditor and auditor's report as an expository convenience.

The study consists of 16 laboratory markets, each with four auditors and four clients who contract via a computerized sealed-offer auction. Each market lasts 15 years with two trading periods (referred to as period 1 and period 2) per year.⁵ At the beginning of period 1, each client is endowed with an asset, the actual value of which is unobservable by the client and auditors. In order to realize the value of the asset, the client must purchase the services of an auditor, who will publicly report the value of the asset for a contracted price. The reported value of the asset, V , can either be high (V_{HIGH}) or low (V_{LOW}), where $V_{\text{HIGH}} - V_{\text{LOW}} = \$1.00$.⁶

In period 1, each auditor submits an offer to each client specifying a price the auditor would charge the client to publicly report a value of the client's asset. The offer price can range from \$0 to \$4.00, and auditors are not required to submit the same offer to each client. There are no costs to submit or receive an offer. The auction does not permit auditors and clients to explicitly engage in either multi-period contracts or contracts in which the price is contingent upon a particular report.

After receiving an offer from all four auditors, each client selects one of the offers. When the client selects an offer in period 1, he incurs a fixed charge of $c = \$0.30$, which may be interpreted as the cost incurred to hire a new auditor. Each of the auditors faces

Footnote 4 (Continued)

feasible in SS because it is a three-party (auditor, client and owner) model with no costly contracting so that owners develop and act on rational expectations by discounting away any client benefit arising from such behavior. The MT model and setting may be more descriptive than SS for audit settings in which, due to costly contracting, cooperative behavior can benefit auditors and clients.

⁵ In order to reduce possible end-game effects, market participants were not told the exact number of trading years.

⁶ In the Agree (Disagree) markets, as described below, $V_{\text{HIGH}} = \$3.68$ (\$3.00) and $V_{\text{LOW}} = \$2.68$ (\$2.00). The values differ between the Agree and Disagree markets in order to equate (approximately) expected client and auditor total earnings within a market based on predicted equilibrium behavior.

the same cost structure. For each client, the selected period 1 auditor incurs a fixed charge of \$2.00 to observe a signal $y \in \{y_{\text{LOW}}, y_{\text{HIGH}}\}$ regarding the actual value of the client's asset. The auditor's \$2.00 fixed charge consists of an observation fee, $v = \$1.60$, and learning fee, $\ell = \$0.40$, which is only incurred during the initial contract period with a specific client. After observing the signal $y \in \{y_{\text{LOW}}, y_{\text{HIGH}}\}$, the selected auditor publicly reports a value $V \in \{V_{\text{LOW}}, V_{\text{HIGH}}\}$ for the asset. If the auditor reports V_{HIGH} after observing y_{LOW} , the auditor is charged a penalty, L , of \$0.25.⁷

At the end of period 1, each of the clients and auditors is provided with a market summary presenting the following for each client: client and selected auditor identification numbers, contract price and report (either V_{HIGH} or V_{LOW}) of the selected auditor. Each auditor's market summary also includes the observation (either y_{HIGH} or y_{LOW}) for each client with whom that auditor contracted. In addition, earnings information is privately presented to each client and auditor. A client's earnings in period 1 equals the selected auditor's reported value (either V_{HIGH} or V_{LOW}), less the auditor's contract price and the fixed charge for hiring a new auditor.

Since the markets consist of four auditors attempting to contract with each client, it is possible for an auditor to wait many periods before contracting with a client. Moreover, the predicted competitive equilibrium implies zero earnings for auditors. Therefore, we paid each auditor \$0.20 each period regardless of whether they were selected by any of the clients. In addition, an auditor's total earnings in period 1 includes earnings from each client who selected him, namely, his price less the \$2.00 fixed charge (observation fee, $v = \$1.60$, and learning fee, $\ell = \$0.40$) and a penalty ($L = \$0.25$) if the auditor reports V_{HIGH} after observing y_{LOW} .

Market operations and derivation of earnings in period 2 are identical to those in period 1, except when the same client-auditor pair recontract in period 2, then the client does not incur a cost to hire a new auditor ($c = \$0.30$) and the auditor does not incur a learning cost ($\ell = \$0.40$). Each trading year is identical except the clients' and auditors' identification numbers are randomly reassigned at the beginning of each year in order to mitigate reputation effects across trading years. Hence, in period 1 of each trading year, subjects are unable to associate the prior actions of a client or auditor based on identification numbers in previous years.

Experimental Design

MT identify necessary conditions for an auditor to impair independence, where independence is operationalized in the laboratory markets as an auditor truthfully reporting his observed value. These conditions are as follows: (1) auditors may disagree on a client's reporting issue, i.e., a particular auditor may observe y_{HIGH} while another may observe y_{LOW} ; (2) at the initial engagement, auditors do not know their own positions on the reporting issue (i.e., whether they will observe y_{HIGH} or y_{LOW}) for that particular client, although each auditor has the same probability of observing y_{HIGH} and the same probability of observing y_{LOW} ; (3) when the reporting issue initially arises, the client does not know whether a particular auditor will observe y_{HIGH} or y_{LOW} ; (4) the reporting issue affects the client for more than one reporting period; (5) quasi-rents accrue to the incumbent auditor; and (6) the auditor earns a net benefit from reporting V_{HIGH} after observing y_{LOW} .

⁷ No penalty was imposed on auditors for reporting V_{LOW} after observing y_{HIGH} because auditors cannot attain any advantage by making such a report. If an auditor reports V_{LOW} after observing y_{HIGH} in period 1, then the client would not have an incentive to recontract with the auditor. If an auditor reports V_{LOW} after observing y_{HIGH} in period 2, then the auditor would reduce the client's earnings without obtaining any monetary gain.

The first treatment in the experimental design is based on MT's necessary condition (1) regarding the homogeneity of auditor observations. If all auditors observe the same value, an auditor will never compromise independence in the MT model. To test this prediction, it is common knowledge to all market participants in one of this study's treatment variations that all auditors observe y_{LOW} in each period. In the other condition, it is common knowledge that each auditor faces an equal probability of observing y_{LOW} or y_{HIGH} in period 1 for each client (i.e., it is possible for auditors to disagree on the observed value of a client's asset).⁸ All clients and auditors also know that the observation by a specific auditor does not change from period 1 to period 2 for a specific client.

Another treatment factor concerns the operationalization of clients. To provide clearer causal insights on auditor and client strategic behavior that may arise in the MT setting, we conduct markets where the roles of both auditors and clients are played by human subjects. As a control benchmark for comparison, we also conduct markets with human auditors and robot (computerized) clients that are programmed to be consistent with strategic client behavior as modeled in MT.⁹ Each human auditor knows how the robot clients are programmed to make decisions, and that the robot-clients have no memory of prior trading years and disregard any auditor attempts at cooperative signaling within and across trading years.¹⁰

In order to assess the effects of these treatment factors, eight two-day experiments consisting of one sealed-offer market per day were conducted, resulting in 16 markets. With respect to the robot vs. human-client treatment, clients were robots in four of the two-day experiments, while clients in the other four two-day experiments were human subjects. Thus, our design contains eight markets with robot clients and eight markets with human clients (referred to as Robot and Human markets, respectively). For the treatment concerning the homogeneity of auditor observations, of the eight robot-client markets, four contained auditors who agree on a client's asset value (referred to as Agree markets) and four contained auditors who could disagree on that value (referred to as Disagree markets). Likewise, of the eight human-client markets, four were Agree markets and four were Disagree markets. The order of the Agree vs. Disagree market treatment was counterbalanced across day 1 and day 2 of the two-day experiments in an attempt to control for possible order effects. In summary, the 16 markets from the eight two-day experiments can be categorized into four market sets (Robot/Agree, Robot/Disagree, Human/Agree and Human/Disagree), with each market set comprised of four markets, where two of the markets were conducted on day 1 and the other two markets were conducted on day 2 of a two-day experiment. Our experimental design is as follows:

⁸ Client inferences differ across these two treatment variations. When the client knows that all auditors will observe a low value, the client is able to make a direct inference (from the auditor's report) whether the auditor has been truthful. In contrast, when the client only knows that each auditor has an equal probability of observing high or low, such a direct inference from reporting behavior is not possible.

⁹ Since each client always observes (believes) the unit is of high value, contradictory beliefs arise in those cases where an auditor observes the low value, which may create a different level of ambiguity for subjects in human-client vs. robot-client markets that could possibly impact the results. However, we are unaware of where or how this is evidenced in market behavior.

¹⁰ The scrambling of subject identification numbers across trading years in order to maximize the independence and minimize the formation of reputation across years is biased (i.e., represents a "best shot" test) toward observing the predicted competitive equilibrium. Consequently, any documented systematic deviations from predictions are an indication of strong incentives for humans to engage in cooperative behavior.

HOMOGENEITY OF AUDITOR OBSERVATION

TYPE OF CLIENT	Agree		Disagree
	Robot	Day 1 Market Day 1 Market Day 2 Market Day 2 Market	followed by followed by preceded by preceded by
	Human	Day 2 Market	Day 2 Market
		Day 1 Market	Day 2 Market
		Day 1 Market	Day 2 Market
		Day 2 Market	Day 1 Market
		Day 2 Market	Day 1 Market
		Day 2 Market	Day 1 Market

All markets were conducted via networked computer terminals at the University of Arizona's Economic Science Laboratory using subjects recruited from University of Arizona M.B.A. classes. Each subject received \$5.00 for arriving at the experiment, as well as any earnings as previously defined. In addition, each auditor was endowed with \$10.00 so that total expected auditor earnings approximated that of clients. Experiments lasted two to three hours each day, with subject payments averaging approximately \$45 for the two-day experiment. Instructions are available from the authors upon request.

Predictions

In the Agree markets, an incumbent auditor in period 2 has two cost advantages over other auditors: the incumbent auditor will not incur the learning cost ($\ell = \$0.40$) that other auditors would incur, and the client will not incur the switching cost ($c = \$0.30$) if he recontracts with the incumbent auditor. This means that the incumbent auditor can earn period 2 profits by setting his fee above his observation cost ($v = \$1.60$) but no more than the client's total cost of engaging a new auditor ($v + \ell + c = \$2.30$). Therefore, in period 1, when all auditors are external candidates, auditors are predicted to submit lowball price offers which exclude the nonrecurring period 1 learning cost ($\ell = \$0.40$) and are further reduced by the client's switching costs ($c = \$0.30$). In period 2, the incumbent auditor is predicted to raise the audit price to recover the $\ell = \$0.40$ and $c = \$0.30$. We assume that when the robot-client is indifferent between recontracting with the incumbent auditor for \$2.30 or selecting a new auditor for \$2.00, the robot-client will elect to recontract with the incumbent auditor.

Regarding reporting behavior in the Agree markets, recall that it is common knowledge that all auditors always observe y_{LOW} . In period 2 of the Agree markets, all auditors will select the cost minimizing report, V_{LOW} , thereby avoiding the penalty ($L = \$0.25$) for reporting V_{HIGH} after observing y_{LOW} . Moreover, by backward induction we do not expect auditors to impair their independence in period 1 of the Agree markets, since the client's sole recourse is to switch to another auditor who will also report V_{LOW} in period 2. Therefore, the following predictions pertain to the Agree markets:

Agree market predictions:

- In period 1, the client and auditor will contract for a lowball price of $P_1 = v - c = \$1.30$.
- In period 2, the client will recontract with the incumbent auditor for a price of $P_2 = v + \ell + c = \$2.30$.
- The auditor will report V_{LOW} in both periods.

In the Disagree Markets, every auditor has a $q = 0.5$ probability of observing y_{HIGH} , and a $1 - q = 0.5$ probability of observing y_{LOW} for each client. Prior to initially contracting, auditors and clients do not know which value an auditor will observe for a client. However, they do know an auditor's observation is the same for both periods with a particular client, but may differ across clients. As in the Agree markets, all auditors will select the cost-minimizing report in period 2. Therefore, in period 2, an auditor who observes y_{HIGH} reports V_{HIGH} , while an auditor who observes y_{LOW} reports V_{LOW} .¹¹ Note that in period 2, each external candidate auditor has a $q = 0.5$ probability of observing y_{HIGH} , and therefore reporting V_{HIGH} . Thus, if the incumbent auditor reports V_{LOW} in period 1, the client has an incentive to hire an external candidate auditor in period 2, thereby obtaining an expected benefit of $q(V_{\text{HIGH}} - V_{\text{LOW}})$ ($0.5 \times \$1.00 = \$0.50$). In period 1, an auditor who observes y_{HIGH} will report V_{HIGH} , while an auditor who observes y_{LOW} will also report V_{HIGH} (impair independence) because the additional profit earned of \$.45 (\$.70 earned in period 2 from recontracting with the client less the \$.25 penalty for impairing independence in period 1) exceeds the additional profit of \$.20 earned from reporting V_{LOW} (profit earned in period 2 from setting a reduced recontract fee of \$1.80 that compensates the client for the \$.50 expected benefit of switching auditors). Therefore, all auditors will report V_{HIGH} in period 1. Clients cannot determine whether an auditor observed y_{HIGH} or y_{LOW} and, therefore, are indifferent between the incumbent auditor and an external auditor in period 2.¹² We assume that when indifferent, a robot-client will recontract with the incumbent auditor. The period 1 offer will include the expected cost of impairment qL ($0.5 \times \$0.25 = \$0.13$) because none of the auditors know what they will observe at the beginning of period 1. Therefore, the following predictions pertain to the Disagree markets:

Disagree market predictions:

- (a) In period 1, the client and auditor will contract for a lowball price of $P_1 = v - c + qL = \$1.43$.
- (b) In period 2, the client will recontract with the incumbent auditor for a price of $P_2 = v + 1 + c = \$2.30$.
- (c) An auditor who observes y_{HIGH} will report V_{HIGH} both periods. An auditor who observes y_{LOW} will report V_{HIGH} in period 1 and V_{LOW} in period 2.

The Agree and Disagree market predictions represent a competitive equilibrium with zero expected yearly profits for auditors. Underlying these predictions is an assumption of no cooperation between auditors and clients. Nevertheless, given our parameter values (specifically, the \$1.00 difference between the high and low reported asset value and the \$.25 penalty) it is possible for clients and auditors to achieve results better than predicted via cooperation in which auditors provide clients with the desired report in exchange for a higher offer price. Still, such cooperative behavior is not an equilibrium because both

¹¹ We assume that if there are multiple cost-minimizing reporting strategies, e.g., an auditor could observe y_{HIGH} and report V_{LOW} , the auditor will select the truthful reporting strategy.

¹² MT refer to an auditor's disutility from reporting contrary to the observation. This disutility could arise for various reasons, including the perceived expected cost of future litigation. In order to capture this disutility and reduce uncertainty in the markets, we operationalized the disutility as a certainty equivalent penalty. Since it is critical in the model that the client not be able to directly infer the type of an auditor, the clients in our markets do not know whether the auditor was penalized. If the probability of investigation was set low enough, we could have operationalized an expected penalty where clients are informed of the penalty outcomes, and the qualitative predictions of the model would still hold.

auditors and clients have incentives to defect from the cooperative relationship. In addition to defection, there are two other reasons why cooperative behavior is difficult to achieve in our markets. First, there is limited interaction between auditors and clients, and it all occurs via the computer network. Auditors provide offer prices and reports, while clients accept offer prices. Second, the identification numbers of auditors and clients are scrambled at the beginning of each new trading year. Despite these obstacles, incentives for cooperation are present.

In order to better assess whether market participants exhibit behavior contrary to competitive equilibrium predictions, the study examines the behavior of markets with robot vs. human clients. As previously discussed, cooperative behavior characterized by higher than predicted prices and lower frequencies of reporting low values could emerge in human-client markets. Markets with robot clients programmed to act consistent with the competitive predictions do not permit cooperative behavior between auditors and clients. As such, robot-client markets represent a benchmark against which human-client markets can be compared. But since cooperative behavior is not an equilibrium, it is unclear to what extent human-client markets will exhibit such behavior. Therefore, we make a null prediction that there is no difference between robot-client markets and human-client markets.

Robot-client vs human-client market predictions:

Markets with robot clients will exhibit the same behavior as markets with human clients.

III. ANALYSIS OF MARKET RESULTS

In this section, we first show that the robot-client markets (where cooperative behavior between auditors and clients is not feasible) exhibit strong support for MT's competitive predictions, despite the considerable use of an undercutting strategy by some auditors to induce other auditors to behave non-competitively. Using the robot-client market results as a benchmark of competitive behavior, we then show that the human-client markets can be broken into two groups: a competitive-group that, like the robot-client markets, exhibits considerable support for the competitive predictions, and a cooperative-group characterized by materially higher pricing and greater misreporting than in the competitive-group.

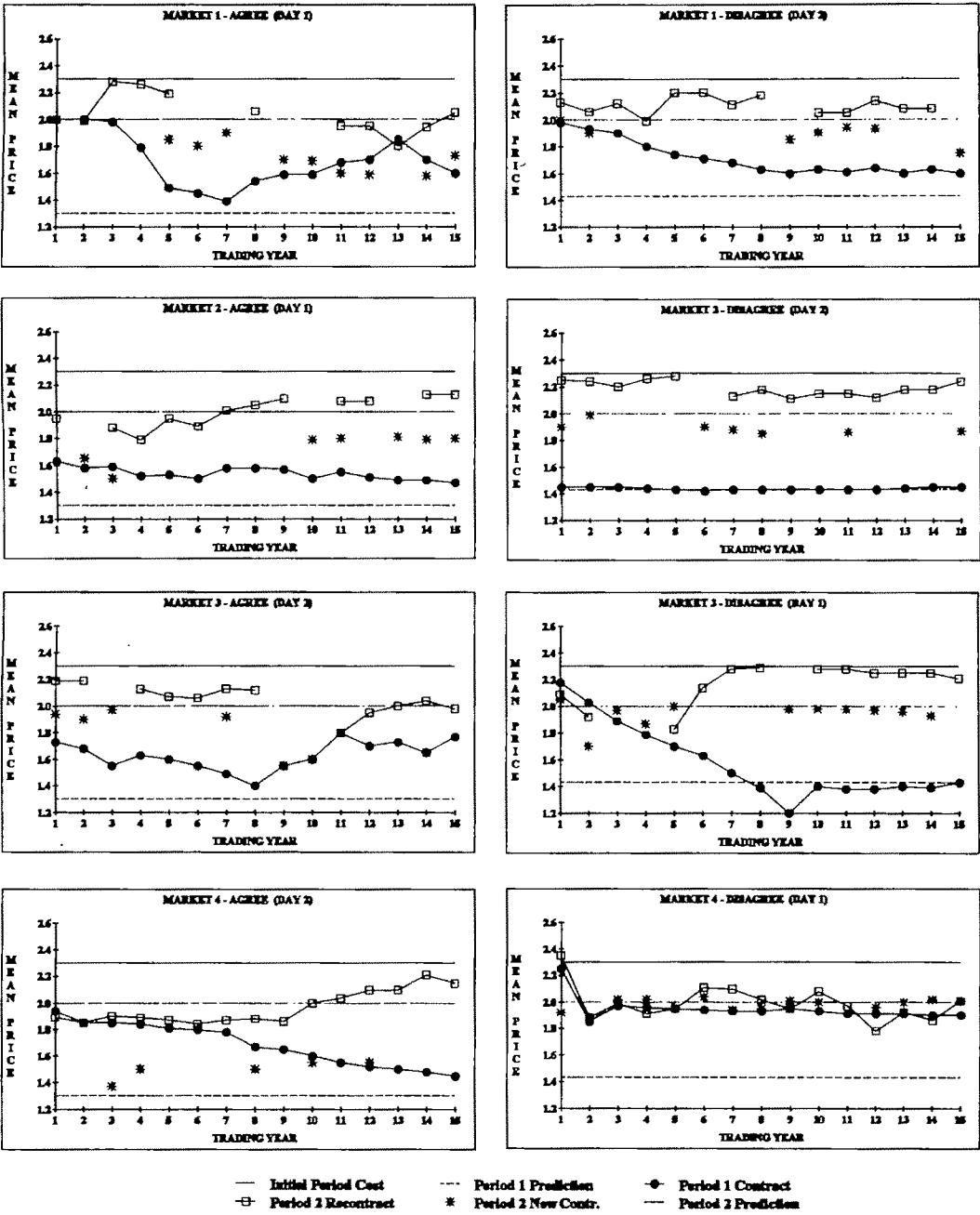
The analysis in this section is based on data contained in figures 1 and 2, and tables 1 and 2. Figure 1 (2) presents the predicted and actual mean period 1 and period 2 prices by trading year for each Agree and Disagree market with robot (human) clients. Table 1 summarizes period 1 and period 2 price data for the last five trading years of each market. Table 2 presents the reporting behavior for the last five trading years by period and observation for each market. To the extent a market converges to systematic behavior over time, we focus on the last five trading years in most of our analyses. Unless otherwise stated, statistical tests assume a .05 level of significance. In the discussion that follows, we use the abbreviations Rob (Hum) for robot-client (human-client) markets, and Agr (Dis) for Agree (Disagree) markets. For example, robot-client Agree Market 1 is abbreviated RobAgr 1.

Robot-Client Markets

Pricing and Reporting Behavior

In aggregate, the robot-client markets provide only limited support for convergence to the period 1 price predictions of \$1.30 (\$1.43) in the Agree (Disagree) markets. Still, figure 1 reveals considerable qualitative support for lowball pricing (i.e., less than \$2.00). First, lowball mean period 1 prices occurred in 58 (57) of 60 trading years in the robot-client

FIGURE 1
Agree and Disagree Markets with Robot Clients



Agree (Disagree) markets. Second, mean period 1 prices are below \$2.00 in each of the last five years of each market, ranging from \$1.30 to \$1.90. Third, most of the robot-client markets exhibit reasonable convergence toward period 1 price predictions, although convergence is less consistent in RobAgr 1 and 3. Only in RobDis 4 is there an apparent absence of convergence.

While a lower lowball price is predicted in the Agree markets (\$1.30) than in the Disagree markets (\$1.43), table 1 data does not support this relationship in the robot-client markets. A paired difference t-test in which each two-day experimental session acts as its own control yielded no significant difference between mean period 1 prices over the last five years in the Agree and Disagree robot-client markets. This lack of significance may be the result of the small difference in predicted prices, as well as the variation in behavior across two-day experimental sessions.

The period 2 price predictions for the Agree and Disagree markets are identical, i.e., that the recontract price with the incumbent auditor will be \$2.30.¹³ As was the case with period 1 prices, the robot-client markets do not converge to the period 2 price predictions, but they do provide qualitative support for predictions. First, the robot-client markets exhibit a great propensity for recontracting at prices greater than new contract prices. Figure 1 shows that across all robot-client markets, the mean new contract price is greater than the mean recontract price in only seven of 120 years. Consistent with this evidence, table 1 reveals that for the last five years, the mean period 2 recontract price is greater than the mean new contract price in seven of eight markets. Second, figure 1 shows that the mean period 1 price is less than the mean recontract price in 113 of 120 years.

Using table 1 data, paired difference t-tests yield no significant difference between the Agree and Disagree robot-client markets for mean recontract prices over the last five years. However, the robot-client markets do exhibit mean new contract prices that are significantly lower in the Agree markets than in the Disagree markets over the last five years.

In terms of reporting behavior, the robot-client markets exhibit strong support for predictions. Agree market auditors, who all observe y_{LOW} , are predicted to truthfully report V_{LOW} (not compromise independence) in both periods. Panel A of table 2 shows that over the last five years of the robot-client Agree markets, reporting behavior is exactly as predicted. In the Disagree markets, an auditor who observes y_{LOW} is predicted to report V_{HIGH} (compromise independence) in period 1 and V_{LOW} in period 2, while an auditor who observes y_{HIGH} is predicted to report V_{HIGH} both periods.¹⁴ Panel B of table 2 shows that reports over the last five years of the robot-client Disagree markets are supportive of predictions, with the exception of RobDis 4 when auditors observed y_{LOW} in period 1.

Comparing the reporting behavior over the last five years between the Agree and Disagree markets, we see that the robot-client markets exhibit the predicted differences and similarities in reports. Consistent with predictions, paired difference t-tests conditioned on an auditor observing y_{LOW} reflect a significantly higher proportion of truthful reports for period 1 in the Agree vs. Disagree robot-client markets, and no significant difference between these two groups of markets for period 2.

¹³ Recall that we assume that when the robot-client is indifferent between recontracting with the incumbent auditor for \$2.30 and selecting a new auditor for \$2.00, the robot-client will elect to recontract. Table 1 provides considerable support for recontracting, and we find no statistical difference between recontracting frequencies across treatment cells.

¹⁴ In period 2 of the Disagree markets, an auditor who observes y_{HIGH} has the same earnings by reporting either V_{HIGH} or V_{LOW} . Still, we assume that the auditor will report V_{HIGH} because this leaves the client better off and represents truthful reporting. The data shows this assumption to be highly descriptive of observed behavior.

TABLE 1
Contract Price Information Over the Last Five Years

		<i>Robot-Client Markets</i>			<i>Human-Client Markets</i>		
	<i>Predicted</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>
<i>Panel A: Agree Markets</i>							
Period 1 contract prices							
Market 1 (Day 1)	1.30	20	1.71	0.09	20	1.56	0.22
Market 2 (Day 1)	1.30	20	1.50	0.03	20	2.26	0.06
Market 3 (Day 2)	1.30	20	1.73	0.06	20	1.86	0.02
Market 4 (Day 2)	1.30	20	1.50	0.04	20	2.32	0.06
Period 2 recontract prices							
Market 1 (Day 1)	2.30	14	1.92	0.09	16	2.13	0.07
Market 2 (Day 1)	2.30	13	2.11	0.11	19	2.08	0.09
Market 3 (Day 2)	2.30	18	1.94	0.10	15	2.37	0.21
Market 4 (Day 2)	2.30	18	2.12	0.10	14	2.38	0.16
Period 2 new contract prices							
Market 1 (Day 1)	2.00	6	1.64	0.08	4	1.84	0.03
Market 2 (Day 1)	2.00	7	1.80	0.08	1	1.60	0.00
Market 3 (Day 2)	2.00	2	1.65	0.00	5	2.02	0.01
Market 4 (Day 2)	2.00	2	1.55	0.00	6	2.43	0.07
Number of “undercutting” prices							
Market 1 (Day 1)		6			4		
Market 2 (Day 1)		7			1		
Market 3 (Day 2)		2			0		
Market 4 (Day 2)		2			0		
<i>Panel B: Disagree Markets</i>							
Period 1 contract prices							
Market 1 (Day 2)	1.43	20	1.62	0.02	20	2.12	0.11
Market 2 (Day 2)	1.43	20	1.44	0.01	20	1.62	0.02
Market 3 (Day 1)	1.43	20	1.39	0.06	20	1.92	0.02
Market 4 (Day 1)	1.43	20	1.90	0.01	20	1.97	0.08
Period 2 recontract prices							
Market 1 (Day 2)	2.30	11	2.08	0.03	14	2.28	0.04
Market 2 (Day 2)	2.30	16	2.17	0.06	11	2.04	0.13
Market 3 (Day 1)	2.30	14	2.24	0.03	16	1.99	0.02
Market 4 (Day 1)	2.30	12	1.91	0.12	15	2.17	0.11
Period 2 new contract prices							
Market 1 (Day 2)	2.00	9	1.85	0.10	6	2.11	0.18
Market 2 (Day 2)	2.00	4	1.86	0.01	9	2.09	0.24
Market 3 (Day 1)	2.00	6	1.97	0.02	4	2.01	0.01
Market 4 (Day 1)	2.00	8	2.00	0.03	5	2.03	0.03
Number of “undercutting” prices							
Market 1 (Day 2)		9			0		
Market 2 (Day 2)		4			2		
Market 3 (Day 1)		6			0		
Market 4 (Day 1)		1			0		

TABLE 2
Truthful Reporting Behavior Over the Last Five Years

	<i>Robot-Client Markets</i>			<i>Human-Client Markets</i>	
	<i>Predicted %</i>	<i>Actual %</i>	<i>Frequency</i>	<i>Actual %</i>	<i>Frequency</i>
<i>Panel A: Agree Markets</i>					
Period 1—Ann. L Obs. L					
Market 1 (Day 1)	100	100	20/20	95	19/20
Market 2 (Day 1)	100	100	20/20	50	10/20
Market 3 (Day 2)	100	100	20/20	15	3/20
Market 4 (Day 2)	100	100	20/20	20	4/20
Period 2—Ann. L Obs. L					
Market 1 (Day 1)	100	100	20/20	95	19/20
Market 2 (Day 1)	100	100	20/20	95	19/20
Market 3 (Day 2)	100	100	20/20	40	8/20
Market 4 (Day 2)	100	100	20/20	35	7/20
<i>Panel B: Disagree Markets</i>					
Period 1—Ann. L Obs. L					
Market 1 (Day 2)	0	10	1/10	75	6/8
Market 2 (Day 2)	0	0	0/8	73	8/11
Market 3 (Day 1)	0	0	0/8	0	0/12
Market 4 (Day 1)	0	82	9/11	33	3/9
Period 1—Ann. H Obs. H					
Market 1 (Day 2)	100	100	10/10	100	12/12
Market 2 (Day 2)	100	100	12/12	100	9/9
Market 3 (Day 1)	100	100	12/12	100	8/8
Market 4 (Day 1)	100	100	9/9	100	8/8
Period 2—Ann. L Obs. L					
Market 1 (Day 2)	100	100	8/8	43	3/7
Market 2 (Day 2)	100	100	8/8	78	7/9
Market 3 (Day 1)	100	71	5/7	100	11/11
Market 4 (Day 1)	100	89	8/9	100	10/10
Period 2—Ann. H Obs. H					
Market 1 (Day 2)	100	75	9/12	85	11/13
Market 2 (Day 2)	100	100	12/12	100	11/11
Market 3 (Day 1)	100	62	8/13	89	8/9
Market 4 (Day 1)	100	100	11/11	70	7/10

In summary, the robot-client markets in the aggregate exhibit considerable support for the pricing and reporting predictions of MT's competitive equilibrium. Still, these markets exhibit some systematic departures from predictions. In particular, period 1 prices are generally above predicted values, while new contract and recontract prices are both generally below predicted values. The robot-client results would have been even more closely aligned with predictions had auditors not engaged in a strategy we refer to as "undercutting."

Undercutting Strategy

Undercutting is defined as the attainment of a contract by a new auditor in period 2 at an offer price less than the auditor's \$2.00 cost. Undercutting was extensive in the

robot-client markets, resulting in both direct and indirect effects on market behavior.¹⁵ Table 1 shows that the mean new contract price was below the \$2.00 cost for the last five years of all robot-client markets except for RobDis 4. Table 1 also shows that undercutting was the dominant reason for auditor failure to recontract in the robot-client markets. The bottom of panel A (B) of table 1 reports the number of new contracts at undercut prices over the last five years in the robot-client Agree (Disagree) markets and shows that new auditors undercut in 10 percent to 35 percent (5 percent to 45 percent) of the possible period 2 contracts, and in 100 percent (74 percent) of new contracts. Therefore, two direct effects of undercutting were to lower new contract prices below those predicted and to reduce the incidence of recontracting. In addition, indirect effects of undercutting were higher period 1 prices and lower period 2 recontracting prices.

In post-experiment debriefing, many subjects playing the role of auditors discussed their motivation for undercutting even when such pricing behavior resulted in a sure loss for the undercutter. These auditors expressed frustration with falling auditor profits when there were substantially higher auditor profits to be earned if only all auditors would provide higher offer prices. They would often undercut if an incumbent auditor's period 1 prices (and resulting profits) were too low and/or an incumbent auditor was contracting with too many clients. In doing so, these auditors were willing to incur a small loss in order to inflict a large loss on the incumbent auditor, thereby using undercutting as a market disciplining strategy. The desired effect of undercutting was to force the incumbent auditor to offer higher prices so that future profits would be larger and/or more evenly shared among the auditors.

While qualitative support for the competitive price predictions in the robot-client markets would have been even stronger if the undercutting strategy had not been prevalent, the fact that prices did not generally increase in the long run suggests that undercutting was not successful in inducing cooperative behavior among auditors. Even though the undercut incumbent auditor generally increased his subsequent offers, other auditors often lowered their offers to win contracts. Also, most auditors who had been undercut in prior years eventually lowered their offers again.

The undercutting behavior in the robot-client markets bears some resemblance to certain aspects of recent real-world audit markets, namely, predator pricing for auditing engagements and auditor displacement (e.g., see, Okell 1991). Of course, we do not know the exact motive(s) for predatory pricing in the real-world that leads to auditor switches, but attempting to obtain auxiliary work (e.g., tax and management advisory services) and/or industry expertise are possible motives. Still, it is not unreasonable to believe that some new auditors may be employing an undercutting strategy, i.e., attempting to discipline an incumbent auditor who, with an exceedingly low price, previously obtained a prospective client. While this strategy is costly in the short run, it could result in more favorable long-run conditions for auditors if it succeeded in reducing (or eliminating) predatory pricing.

Undercutting behavior is only found in the robot-client markets; the human-client markets rarely exhibited such a pricing strategy to induce cooperation amongst auditors.¹⁶

¹⁵ This study presents the first strong evidence of such pricing behavior, as prior market experiments (e.g., Schatzberg 1990, 1994; SS 1994) contain a period 2 pricing rule that suppresses the ability to undercut. Some SS markets do not possess a period 2 pricing rule limiting undercutting behavior. While there appears to be some evidence of undercutting in these markets, assessing such behavior is difficult because cost uncertainty makes it possible for a price below expected cost to be greater than the realized cost.

¹⁶ Undercutting occurred relatively rarely in the human-client markets. Figure 1 (2) shows that across all eight robot-client (human-client) markets, 50 (7) of 120 trading years had mean new contract prices less than \$2.00. Table 1 reveals that over the last five years robot-client (human-client) Agree and Disagree markets had 17 and 20 (5 and 2) undercutting prices, respectively.

However, many human-client markets exhibited behavior consistent with strategic signaling and cooperation between auditors and clients. In the next section, we present the human-client results and discuss how such strategies may account for the departures from predictions found in many human-client markets.

Human-Client Markets

MT's predictions assume competitive behavior resulting in zero expected yearly profits for auditors. However, it is possible (given the low penalty parameter set used in the study) for clients and auditors to achieve results better than predicted via cooperation in which auditors provide clients with the desired report in exchange for a higher offer price. For example, if an auditor reports V_{HIGH} instead of V_{LOW} , he increases the available payout by \$1.00. Even when he is penalized \$0.25 (if he had observed y_{LOW}), there is a net increase in payoff that the auditor and client may share. While this cooperative behavior can leave both the auditor and client better off than under the competitive predictions, incentives to defect prevent it from being an equilibrium.

In post-experiment debriefing of subjects in the human-client markets, many subjects playing the roles of auditors and clients disclosed that they often attempted to signal and cooperate. Auditors attempted to signal, via a relatively high offer price, a promise to provide the desired report (i.e., V_{HIGH}) if selected. Likewise, clients often inferred a high offer price to be an auditor's signal of a promise to report V_{HIGH} , and selected the auditor. In fact, these clients often selected an offer price that was greater than other available prices. Acceptance of the auditor's high offer price in expectation of the desired report represents cooperative behavior on the part of the client. Once the auditor's high offer price was accepted, the auditor decided whether to deliver the V_{HIGH} report. Reporting V_{HIGH} results in a \$0.25 penalty if the observation was y_{LOW} , but may make it easier to contract at relatively high prices in the future (period 2 of the trading year and future trading years). Failing to report V_{HIGH} avoids any penalty, but may make it more difficult to contract at high prices in the future.

We conjecture that the potential for cooperative behavior and deviation from the equilibrium depends on the (1) Agree-Disagree treatment; (2) period within a trading year; and (3) experimental day. Period 1 in the Agree markets possesses the greatest potential for cooperative behavior because the client (and auditor) can gain from cooperative reporting relative to the predicted truthful report of V_{LOW} , and the client has some recourse in that he can terminate a non-cooperating auditor in period 2. Period 2 in both the Agree and Disagree markets possess the same and next highest potential for cooperation. Again, a client (and auditor) gain from cooperative reporting vs. the truthful reporting equilibrium, but it is difficult for the client to enforce cooperative behavior because it is the final period of the trading year. Period 1 in the Disagree markets does not have any potential for deviating from the predictions because competitive and cooperative reporting behavior are identical in this period. Finally, the experimental day may have an impact because incentives for cooperation increase as market results converge toward the competitive prediction of zero expected profits for auditors. Since the degree of convergence to the competitive equilibrium often increases over the duration of a market, incentives to achieve a more cooperative outcome may be higher in the second day of a two-day experiment.

Using the robot-client market results as a benchmark for competitive behavior, we find that the human-client markets can be broken into two groups that differ greatly in their behavior. One group of markets (referred to as the competitive-group) exhibits behavior

with many similarities to that of the robot-client markets, i.e., quite supportive of the competitive predictions. In contrast, the other group of markets (referred to as the cooperative-group) exhibits considerable behavior consistent with signaling and cooperative strategies, which is contrary to the competitive predictions.

Competitive-Group

The competitive-group of human-client markets consists of HumAgr 1 and HumDis 2–4. Behavior in these markets exhibits many similarities to the competitive behavior of the robot-client markets, although the competitive behavior in some cases did not appear as early or as strongly as in the robot-client markets. Consistent with our conjectures regarding the potential for observing cooperative behavior, three of the competitive-group markets are Disagree markets, and three of the markets occurred on the first day of a two-day experiment.

Focusing on pricing behavior in the competitive-group markets, figure 2 and table 1 reveal considerable support for competitive predictions. First, mean period 1 prices generally decrease toward the competitive predictions. Second, mean period 1 prices over the last five years are below \$2.00 (i.e., lowballing), ranging from \$1.56 to \$1.97. Third, applying the Smirnov test, the mean period 2 recontract prices are significantly greater than mean period 1 prices for the last five years.¹⁷ Finally, period 2 prices allow the auditor to capture quasi-rents.

The reporting behavior in the competitive-group markets also exhibits support for the competitive predictions. Panel A of table 2 shows strong support for truthful reporting predictions in both periods of HumAgr 1. Focusing on panel B of table 2, we see that reporting behavior for both periods of HumDis 2–4 is generally supportive of predictions: reports of auditors observing y_{HIGH} are truthful, and reports for auditors observing y_{LOW} are truthful in period 2 but not in period 1. The competitive-group's only failure to support the reporting predictions is in period 1 of HumDis 2 for auditors observing y_{LOW} .

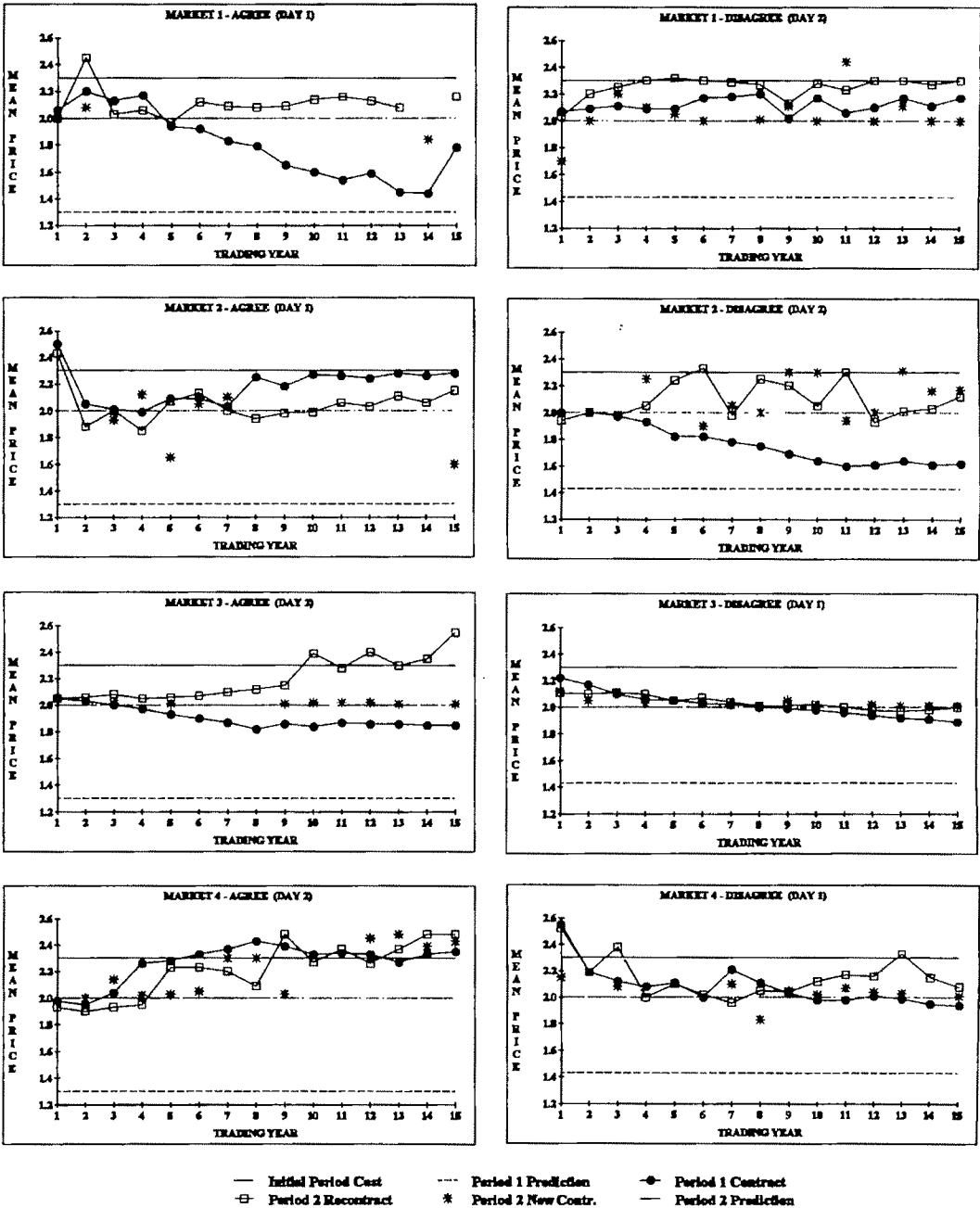
The findings in the competitive-group of our human-client markets provide insights for real-world auditing markets. First, it appears that in some cases competitive pricing and reporting behavior occurs even when the opportunity exists for auditors and clients to attain better outcomes via cooperative behavior. This suggests that a large penalty is not always necessary to prevent auditor misreporting resulting from cooperative behavior. Second, it appears that auditor disagreement on the appropriate accounting treatment for a client issue can impact reporting behavior. This suggests that greater agreement among auditors regarding the interpretation and application of generally accepted accounting principles may reduce the likelihood of auditor misreporting behavior.

Cooperative-Group

The cooperative-group of human-client markets consists of HumAgr 2–4 and HumDis 1. The results in these markets exhibit numerous departures from the competitive predictions and, instead, are largely consistent with signaling and cooperation strategies. In addition, these results are not found in any of the robot-client or competitive-group markets. Consistent with our conjectures regarding the potential for observing cooperative behavior, three of the markets are Agree markets, and three of the markets occurred on the second day of

¹⁷ To conduct the Smirnov test, empirical distribution functions based on two random-sample data sets are derived. The statistical significance of any difference between the two data sets is determined by assessing the greatest difference between the empirical distribution functions. See Conover (1980) for a more detailed discussion.

FIGURE 2
Agree and Disagree Markets with Human Clients



a two-day experiment. In fact, there was a general pattern of convergence toward the competitive predictions (with zero expected earnings for auditors) in first-day markets, followed by cooperation in second-day markets. This suggests that as auditors experienced declining earnings over the trading years of first-day markets, they began to search out alternative pricing and reporting strategies involving signaling and cooperation.¹⁸

Figure 2 and table 1 show that prices in the cooperative-group are generally higher than the prices in the markets supporting competitive predictions. Unlike the pervasive lowball period 1 pricing observed in the robot-client and competitive-group human markets, three markets in the cooperative-group (HumAgr 2 and 4 and HumDis 1) have mean period 1 prices over the last five years between \$2.12 and \$2.32. With respect to period 2, the mean recontracting (new contract) prices of three (two) of the four cooperative-group markets are greater than those of any of the eight robot-client or four competitive-group markets. Applying the Smirnov test, both the mean period 1 prices and the mean period 2 recontract prices over the last five years in the cooperative-group markets are significantly higher than those in both the robot-client markets and the competitive-group markets.

The reporting behavior in the cooperative-group markets departs from competitive predictions far more than in the robot-client and competitive-group markets. Focusing on the cooperative-group Agree markets, where the competitive predictions are truthful reporting in both periods, panel A of table 2 shows strong departures from predictions. Specifically, auditors in HumAgr 2–4 provide truthful reports only 50 percent, 15 percent and 20 percent (95 percent, 40 percent and 35 percent) of the time in period 1 (2), respectively. Consistent with our conjectures, the cooperative HumAgr 2–4 markets exhibit more independence impairment in period 1 relative to period 2. In contrast, the comparable truthful reporting percentages in both periods are 100 percent in all robot-client Agree markets and 95 percent in the only competitive-group Agree market. Applying the Smirnov test, non-truthful reporting is significantly higher in both periods of the cooperative-group Agree markets vs. the robot-client Agree markets.

There is a wide variety of individual auditor reporting behavior over the last five trading years in the cooperative-group markets,¹⁹ which suggests that cooperative behavior is not stable, even though both auditor and client are better off than in the predicted competitive equilibrium. For period 1 in HumAgr 2, after observing y_{LOW} , one auditor reported V_{HIGH} on all eight of his contracts, while two auditors reported V_{LOW} on all of their four and five contracts, respectively. Over both periods in HumDis 1, the two auditors with the highest (lowest) mean prices reported V_{HIGH} (V_{LOW}) after each of their six (nine) total observations of y_{LOW} . Over both periods in HumAgr 3, three auditors reported truthfully in only three of their 32 contracts, while the remaining auditor reported truthfully in all of his eight contracts. Finally, in HumAgr 4, one auditor never reported truthfully in 14 contracts over both periods, two auditors reported truthfully in one (seven) of 11 (seven) period 1 (period 2) contracts, while the remaining auditor reported truthfully in three (zero) of three (five) period 1 (period 2) contracts. This variation in individual auditor reporting behavior reflects differences in individual willingness to defect that were expressed in post-experiment debriefing.

¹⁸ The different results in the robot vs. human-client markets documented here do not necessarily contradict the results in the robot-client market of SS. Because cooperation cannot benefit the auditor and client in SS, there is no reason to believe *ex ante* that utilizing human clients would yield systematically different market behavior, other than the potential for price undercutting as discussed above.

¹⁹ As documented in Schatzberg et al. (1996), robot-client markets of SS also exhibit variation in individual reporting behavior, although not due to cooperative influences.

The results in these cooperative-group markets suggest that when the penalty cost is relatively low, a different relationship between lowball pricing and independence may arise in the audit market. Under both Agree and Disagree conditions, independence impairment may occur in conjunction with premium pricing (no lowballing). Additionally, markets alone may be insufficient to always ensure auditor independence; a relatively large misreporting cost may also be necessary.

IV. DISCUSSION

The MT predictions are formed by competition among non-cooperative auditors that leads to equilibrium conditions in which auditors lowball and earn zero total expected profits, and only impair their independence when it increases their net future profits. However, given a relatively small penalty cost for independence impairment, auditors have incentives to engage in cooperative behavior to improve upon the competitive predictions. We find support for the competitive predictions in both the Agree and Disagree robot-client markets. In the Agree markets, homogeneous auditors lowball and do not impair independence, acting as if they believe that misreporting will not increase their future profits. In the Disagree markets, heterogeneous auditors lowball and impair independence in period 1, acting as if they believe that the penalty from misreporting in period 1 is less than the future profits earned in period 2 from this strategy. When cooperative behavior between the client and auditor is infeasible in the market, we find that price undercutting may occur in attempts to discipline and encourage auditors to refrain from predatory pricing.

Using the robot-client markets as a benchmark of competitive behavior, we find that the competitive-group human-client markets provide general support for the model's predictions. We also find that the cooperative-group of human-client markets exhibit behavior consistent with signaling and cooperative strategies; auditors charge higher prices and often impair their independence in both periods. In contrast to the preliminary conclusions offered by Schatzberg et al. (1996) that auditor heterogeneity is a necessary condition for independence impairment, we find from more complete tests that auditors may impair independence even if they have homogeneous beliefs. The Schatzberg et al. (1996) analysis focused only on robot-client markets that did not permit cooperative play. An implication for future experimental work is that simplifications such as using computerized traders for some market roles must be carefully considered, because they may limit the ability to reveal insights on market behavior.

Contrary to the concerns of regulators, this study exhibits independence impairment when lowballing is absent, but only when the misreporting penalty is low. As evidence that the low penalty may be a necessary condition for cooperative behavior to arise in human-client markets, we conducted two human-client two-day experiments (randomized by experimental day) where the penalty was set to \$1.50, rather than \$0.25. The \$1.50 penalty induces a truthful-reporting competitive equilibrium for periods 1 and 2 of both the Agree and Disagree markets, and makes it impossible for the auditor and client to cooperate in order to improve upon the competitive predictions. Similar to the robot-client markets and the competitive-group of human-client markets, the results in the human-client markets with a \$1.50 penalty are highly supportive of the competitive predictions. Specifically, lowballing occurs in 44 of 60 trading years, and truthful reports averaged 96 percent (99 percent) overall (over the last five trading years) for these four markets.²⁰ Thus, it appears that

²⁰ We also conducted four robot-client markets with the \$1.50 penalty, two of which are also discussed in Schatzberg et al. (1996). Similar to the human-client markets with a \$1.50 penalty, the pricing and reporting behavior of these markets was consistent with competitive predictions.

auditors will not impair independence when the penalty for detected impairment is relatively large. While some might argue that markets alone may be sufficient to ensure independence, our findings suggest that some material penalty is also necessary, and when the penalty is relatively low, some auditors may cooperate at the expense of truthful reporting.

Future studies can continue this research stream by further identifying the conditions that facilitate competitive and cooperative strategies in audit quality and pricing relationships. For example, audit market behavior may be influenced by the individual ethics of auditors and clients in the market. A laboratory study that uses a measure of moral reasoning as a treatment variable may provide insights into the impact of this dimension of human behavior. Additional studies could also examine the underlying factors for undercutting behavior observed in this study, or incorporate the cooperative and signaling behavior documented here into a more complete and descriptive analytical model. Finally, future research could consider the effects of other audit market attributes on the relationship between lowballing and independence, e.g., tax and consulting services, partner compensation schemes and legal liability regimes.

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Earnings Predictability and Bias in Analysts' Earnings Forecasts

Somnath Das

University of Illinois at Chicago

Carolyn B. Levine

Duke University

K. Sivaramakrishnan

Texas A&M University

ABSTRACT: This paper examines cross-sectional differences in the optimistic behavior of financial analysts. Specifically, we investigate whether the predictive accuracy of past information (e.g., time-series of earnings, past returns, etc.) is associated with the magnitude of the bias in analysts' earnings forecasts. We posit that there is higher demand for non-public information for firms whose earnings are difficult to accurately predict than for firms whose earnings can be accurately forecasted using public information. Assuming that optimism facilitates access to management's non-public information, we hypothesize that analysts will issue more optimistic forecasts for low predictability firms than for high predictability firms. Our results support this hypothesis.

Key Words: *Earnings forecasts, Earnings predictability, Forecast bias, Forecast optimism.*

Data Availability: *Data are commercially available from the sources identified in the text.*

I. INTRODUCTION

Overview

Financial analysts are an important source of information to stock market participants in the valuation of firms. It has been well established that analysts' earnings forecasts are more accurate (i.e., have smaller unsigned forecast errors) than predictions from

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the past time-series of earnings. For example, Brown et al. (1987) compare the accuracy of analysts to time-series models based on historical earnings data. They attribute analysts' superiority to a timing advantage (more information is publicly available if the forecasts are made after the public announcement dates) and an informational advantage (more information is used by the analysts than historical earnings data). Fried and Givoly (1982) provide evidence that analysts' forecasts errors have incremental value above and beyond errors from time-series models in explaining forecast period returns. Despite analysts' superiority over time-series models, several papers have documented the prevalence of forecast optimism, i.e., forecasts that exceed true earnings (Brown et al. 1985; O'Brien 1988; Butler and Lang 1991). The primary goal of this paper is to further our understanding of analysts' forecasting behavior by investigating a determinant of cross-sectional differences in forecast optimism.

In performing the primary tasks of issuing earnings forecasts and stock recommendations, sell-side analysts can be viewed as providing two broad types of services to the investment community (Schipper 1991). The first is the assimilation and processing of publicly available information, and the second is the acquisition and dissemination of new information. We hypothesize that the demand for additional information is a function of how much information already exists in the public domain (e.g., past earnings, prices), and how reliably future earnings can be predicted from the available public information. If a firm's earnings can be predicted relatively accurately based upon public information, the extent to which additional non-public information improves upon the market's earnings expectation is limited. Consequently, an analyst may be less inclined to expend effort to acquire non-public information (e.g., from the firm's management) for such a firm. In contrast, there is likely to be a greater demand for additional information about firms whose earnings are difficult to predict based upon public information (hereafter, low predictability firms). As a result, the analyst has relatively more to gain from efforts to acquire non-public information for these firms.

In a competitive market for analysts' forecasts, we hypothesize that analysts strive to meet the higher demand for non-public information on low predictability firms. One of the most important sources of non-public information for analysts is corporate management (Financial Executive Research Foundation 1987). There is considerable anecdotal evidence indicating that managers penalize analysts based upon the content of their forecasts by limiting or cutting off analysts' future contact with management (Berg 1990; Laderman et al. 1990; Scism 1993; Dirks and Gross 1974). Mr. Siconolfi, for example, writes "It's a fact of life among Wall Street securities analysts: Bash a company in a research report and brace for the deep freeze. [M]ore and more companies...are lashing out if analysts write negative reports" (Siconolfi 1995). Further, Siconolfi suggests that managers retaliate against bearish analysts by excluding the analysts from mailings, meetings, outings and conference calls with top company executives. The implication is that "positive" reports may facilitate analysts' access to managers and their information (i.e., a *quid pro quo*). If deliberate optimism increases analysts' access to non-public information, and such information is in greater demand for low predictability firms (more likely to lead to revisions of the market's expectations), then a greater degree of analyst optimism will be observed for low predictability firms.

Absent such incentive considerations, we would not expect earnings forecasts to be systematically biased. Forecasts could vary in accuracy across firms, but inaccuracy *per se* does not translate into a bias. Absolute forecast errors may be larger for firms which are hard to predict, but analysts should err equally in both directions (under- and overestimates of future earnings) if they reveal their true, undistorted expectations. However, while biasing

a forecast, *ceteris paribus*, reduces accuracy, a biased forecast can be *more* accurate than an unbiased forecast if the former is based on more precise information. In other words, analysts concerned with the accuracy of their predictions will benefit from biasing their forecasts whenever the gains from the consequent information access outweigh the accuracy loss from biasing *per se*. That is, analysts are willing to incorporate optimism into their forecasts because they can be more accurate with the increased information and bias than with unbiased forecasts based solely on public information.

Consistent with our hypothesis, we document a negative association between earnings predictability and forecast optimism. Our results are robust to alternative measures of predictability based on (1) past time-series of earnings, (2) past time-series of earnings and market returns, and (3) Value Line predictability rankings. Finally, our results indicate that although earnings predictability and earnings variability are related, the variability in a firm's earnings stream does not seem to drive the association between predictability and forecast bias.

Prior Research

Several papers address optimism in analysts' forecasts. Francis and Philbrick (1993) examine the hypothesis that forecast bias is driven by analysts' desire to curry favor with management. This management-relations hypothesis underlies our analysis as well. The difference is that Francis and Philbrick (1993) establish a relationship between optimism and the Value Line stock recommendations. They find that analysts incorporate optimism into their forecasts to repair management relations, following sell recommendations. In contrast, we focus on a firm characteristic, i.e., earnings predictability as a potential determinant of analyst forecast bias.

Lin and McNichols (1993) and Dugar and Nathan (1995) provide evidence that analysts exhibit greater optimism for firms that are underwriting and investment banking clients. These papers suggest that the optimism helps the analyst by maintaining/building client relationships. These papers specifically examine settings in which analysts face a conflict between pleasing their firms' clients and issuing accurate forecasts, and provide evidence that the consequent incentives give rise to analyst optimism. In an experimental setting, Hunton and McEwen (1997) also find that underwriting opportunities intensify analysts' tendency to issue optimistic earnings forecasts.¹ In contrast, we focus on situations in which there is no investment banking or underwriting relation, and seek evidence about whether forecast optimism is related to analysts' need to have access to management for the purpose of issuing accurate forecasts. Accordingly, we examine forecasts issued by Value Line analysts, who do not have underwriting or brokerage relations with the firms they follow.

McNichols and O'Brien (1997) suggest an alternative explanation for the existence of *ex post* optimism in analysts' forecasts. They posit that the observed bias in analysts' forecasts is the result of self-selection, whereby analysts with relatively unfavorable information choose to drop out of the pool of forecasters. Hayes (1995) demonstrates that such forecasting behavior can be justified in the presence of commission-based compensation and short-sales restrictions. However, both of the above papers assume that, conditional on forecasting, analysts report their information undistorted. In contrast, our paper belongs to the body of literature that posits the existence of incentives that motivate analysts to issue

¹ Additionally, they demonstrate that the existence of other motivational incentives, such as the promise of continued employment with the same brokerage firm and the continued following of the same firm, also intensify the propensity to issue optimistic forecasts.

forecasts that differ from their true expectations. Specifically, we examine whether earnings predictability is a determinant of this strategic bias.

Kross et al. (1990) examine the cross-sectional determinants of analysts' forecast advantage over that of mechanical time-series models. They measure analysts' forecast advantage as the difference between the absolute forecast error of the mechanical time-series model and the absolute forecast error of Value Line forecasts. They find that the analysts' advantage is positively related to the variance of the time-series model error term and to the amount of coverage in the *Wall Street Journal*. Their result indicates that the relative advantage of analysts over time-series models is greater for firms that have a larger time-series model error variance. Lys and Soo (1995) find that the absolute value of analysts' forecast errors is positively related to the mean absolute forecast error from time-series models and negatively related to firm size and the number of analysts following the firm. They do not find a significant association between analysts' accuracy and the amount of coverage in the *Wall Street Journal*. Together these two studies indicate that firms which are difficult to predict using time-series models are also difficult for analysts to predict, although the relative advantage of analysts over time-series models is greater for firms that have a larger time-series model error variance. Butler and Lang (1991) examine individual analysts' forecasting behavior relative to the consensus. After controlling for earnings variability, they find that individual analysts tend to be systematically optimistic or pessimistic relative to an optimistic consensus. However, on average, there are no systematic differences in the analysts' overall accuracy. In contrast to the above papers, our paper links earnings predictability to forecast bias as opposed to forecast accuracy. Under the premise that managers prefer optimism, our paper tests the hypothesis that analysts issue optimistic forecasts to obtain access to management information in order to enhance forecast accuracy, even with the bias.

The paper proceeds as follows. Section II describes the data and sample selection. In section III, we present our methodology. Section IV presents results and tests of robustness. Finally, section V provides concluding remarks.

II. DATA AND SAMPLE SELECTION

We use forecast data from Value Line Survey. The use of Value Line forecasts is motivated by several factors. First, Value Line is neither a brokerage nor an underwriter, and thus any potential biases in Value Line forecasts cannot be attributed to incentives for promoting security transactions. Second, Value Line analysts report a measure of earnings predictability that is useful for our analysis. Finally, we can partially control for the effects documented in Francis and Philbrick (1993) by using timeliness rankings provided by Value Line.

Following prior work on this topic, we restrict our attention to December year-end firms (e.g., see O'Brien 1988; Francis and Philbrick 1993). To obtain Value Line forecast data, we first select a sample of 785 December year-end firms, by choosing, sequentially, one out of every three December year-end firms from the 1994 annual Compustat Primary, Supplementary and Tertiary data tapes. We are able to acquire forecast data from Value Line for 605 of these firms for the period 1989–1993. We require complete forecast data for the firms in order to estimate bias for each firm, and therefore eliminate 137 firms for which forecasts are missing during the period 1989–1993. For the remaining 468 firms, we require that annual earnings-per-share data (annual data item #58) and related information be available for all years between 1969 and 1994, and that quarterly earnings-per-share data (quarterly data item #19) and related information be available for *all* years between 1979 and 1994. We impose these stringent requirements to ensure that there are enough

observations to estimate time-series expectation models of annual earnings per share. This requirement reduces the sample size to 274 firms.

For each firm, the data set provided by Value Line contains four forecasts per year. We refer to these forecasts as Horizon 1, Horizon 2, Horizon 3 and Horizon 4 forecasts, respectively. The Horizon 1 forecast is the forecast issued the farthest from the fiscal year-end and the Horizon 4 forecast is the closest to the fiscal year-end. We examine the forecasting behavior on a horizon-by-horizon basis following Kang et al. (1994), who document a horizon effect in forecast bias. We are able to extract the price and returns data from the CRSP database for all of these firms. We access the I/B/E/S database for a measure of the number of analysts following each firm. This information is available for 241 out of the 274 firms. Our final sample size is 239 firms because the timeliness ranking is missing for two firms.

In table 1, we list industries (two-digit SIC code) that are represented by more than ten firms in the sample, along with the percentage of firms belonging to these industries in the Compustat Primary, Supplementary and Tertiary database. Relative to Compustat, our sample exhibits especially high concentrations for Plastics, Pharmaceuticals & Chemicals (SIC two-digit code 28), Machinery & Equipment, and Electrical, Electronics & Appliances (SIC two-digit codes 35 and 36), and Utilities (SIC two-digit code 49). This prompts us to examine whether these concentrations affect our results.

III. RESEARCH DESIGN

To the extent that historical earnings and other public information allow analysts to make fairly accurate predictions of annual earnings, there is less need to obtain private

TABLE 1
Industries Represented by Ten or More Firms in the Sample
Sample size = 274 firms

<i>Two-Digit SIC code</i>	<i>Industry Name</i>	<i>Number of Firms</i>	<i>Percentage^a of Sample</i>	<i>Percentage^b in Compustat</i>
20	Food and Kindred Products	10	4	2
26	Paper	17	6	1
28	Plastics, Pharmaceuticals & Chemicals	32	12	4
29	Petroleum Refining, Paving and Roofing Materials	14	5	1
33	Iron & Steel Metal	11	4	2
35	Machinery & Equipment	22	8	3
36	Electrical, Electronics & Appliances	16	6	3
49	Utilities	51	19	6

^a All percentages rounded off to the nearest integer.

^b Percentages of firms in the 1995 Annual Primary, Supplementary and Tertiary Compustat database.

information for that purpose. In contrast, when future earnings are difficult to predict using information available in the public domain, there is more scope for non-public information to improve the accuracy of such predictions. The management-relations hypothesis posits that analysts' access to non-public information may depend on analysts' willingness to provide optimistic forecasts in order to maintain relations with managers who provide that information. Taken together, the greater demand for information for low predictability firms, and the necessity of biasing forecasts to gain access to that information implies an inverse relationship between earnings predictability and an optimistic bias in analysts' forecasts. In this section, we describe the procedure to examine this relationship.

We denote the analysts' forecast bias as BIAS and the degree to which earnings are difficult to predict as UNPRED and consider their relationship within the following cross-sectional regression (firm subscripts suppressed):

$$\begin{aligned} \text{BIAS} = & a_0 + a_1(\text{UNPRED}) + a_2(\text{FOLLOWING}) + a_3(\text{SIZE}) \\ & + a_4(\text{FOLLOWING} * \text{UNPRED}) \\ & + a_5(\text{SIZE} * \text{UNPRED}) + a_6(\text{TIMELY}) + \varepsilon. \end{aligned} \quad (1)$$

We devote the remainder of this section to defining the variables in equation (1) and describing their measurement.

Forecast Optimism (BIAS)

The dependent variable, BIAS, is measured using analyst forecast errors in the period between 1989 and 1993. Specifically, we compute BIAS in horizon n as (suppressing firm subscript):

$$\text{BIAS}_n = \frac{1}{N_n} \sum_{t=89}^{93} \frac{A_t - \text{AF}_n}{P_t}, \quad (2)$$

where N_n is the total number of forecasts corresponding to Horizon n in the test period (1989–1993). A_t denotes the annual earnings realization (EPS) for year t , AF_n is the analyst forecast over Horizon n in year t . A negative value of BIAS indicates average optimism for a particular firm over the test period. The stock price, P_t , is used as the scaling variable. In the absence of deliberate optimism, we expect Value Line forecast bias to be zero. Of course, since analysts' forecasts are estimates, the realized forecast error each year will differ from zero. Our variable of interest is the systematic forecast bias that persists over a given period. This bias is best captured by the mean forecast error over time.²

Earnings Predictability (UNPRED)

Our objective is to develop a measure of the *inherent* earnings predictability of a firm. Our primary measure, UNPRED, reflects how difficult it is to predict a firm's future earnings from historical earnings information. Because past earnings information is a subset of public information, and our theoretical arguments are based upon a predictability measure conditioned upon all public information, we will examine the sensitivity of our results to two

² Further, using the BIAS variable without averaging would also introduce serial correlation in the error terms, affecting the standard errors of the coefficient estimates. A similar averaging procedure is found in Lys and Soo (1995).

additional measures of earnings predictability. The results using these alternative measures are presented in a later section.

In order to understand our primary measure of annual earnings predictability, it is important to recognize that the set of public information available to make predictions changes as the fiscal year progresses and this difference in information availability will affect measured predictability. For example, predictability of annual earnings, measured in the first quarter of a fiscal year, is likely to differ from predictability measured in the last quarter because more public information is available to condition the prediction as time passes. Given our focus on the strategic information acquisition behavior of a financial analyst, we are not interested in this "horizon" effect. Thus, we estimate earnings predictability at different points in time during the course of a fiscal year (i.e., after each quarter) and use these estimates to develop a composite or average measure that captures the underlying common predictability component in these estimates.

We estimate this composite measure using the forecast errors from time-series models. We realize that, absent knowledge of the true time-series process underlying earnings, any chosen time-series model will measure predictability from historical earnings with error. Such misspecification errors will result in earnings appearing less predictable than they actually are, reducing the power of tests of association between predictability and forecast bias. One approach to mitigating this loss of test power is to generate multiple time-series predictions, using a variety of models that assume different structures, and select the model that predicts the earnings of a firm most accurately for each horizon.

Motivated by these considerations, we use a three-step approach to measure predictability of earnings from historical earnings data.

1. We use three annual and two quarterly time-series models to generate predictions over different horizons for a given year. These models are described in the appendix.
2. For each individual model, we construct an accuracy metric using predictions generated by these models for the measurement period earnings (1983–1988), and choose the model that predicts earnings most accurately over each horizon, giving one model for each firm for each horizon. Accuracy is the extent to which a prediction is "close" to the true value, without attaching significance to the direction of the prediction error. We measure accuracy as the absolute value of the difference between the prediction and the actual earnings, deflated by year-end share price.
3. We perform a principal component analysis using, as factors, absolute prediction errors (accuracy) corresponding to each horizon in the measurement period (using the model chosen in Step 2 for that horizon). As an example, consider firm j in Horizon 1. Suppose that the model chosen in Step 2 above for firm j is the submartingale model. Horizon 1's factor is calculated as the absolute value of the difference between the submartingale model's prediction for firm j and firm j 's actual earnings, deflated by share price.

This procedure yields six observations per firm for each factor, covering the six years in the measurement period. We construct four distinct factors corresponding to the four horizons. We stack these observations for all firms in our sample

to perform the principal component analysis.³ For each firm, we use the average of the first principal component scores over the measurement as an estimate of its inherent earnings predictability (UNPRED). High values of UNPRED indicate earnings that are difficult to predict accurately using these time-series models.

We refer the reader to the appendix, for specific details on this three-step procedure.

Our hypothesis predicts a negative coefficient on the variable UNPRED, ($a_1 < 0$), i.e., the higher the value of UNPRED, the lower the earnings predictability and thus the more negative the forecast bias (i.e., the greater the forecast optimism).

Analyst Following (FOLLOWING)

We control for the impact of analyst following on forecasting behavior. Bhushan (1989) and O'Brien and Bhushan (1990) suggest that analyst following is determined by firm size and degree of institutional holdings, but do not examine how analyst behavior is influenced by the number of analysts following a firm or vice versa. It can be argued that analysts can extract higher rents by following less predictable firms because the demand for non-public information is the highest for these firms. If issuing optimistic forecasts facilitates attaining non-public information (as we hypothesize), there would be a negative relationship between forecast bias and analyst following. Furthermore, a large analyst following for a given firm suggests greater competition among analysts, which may also influence the level of bias. We use the average number of analysts, over the period 1989–1993 reported in the I/B/E/S summary tape, as the measure of analyst following.

Firm Size (SIZE)

We include a control for firm size (SIZE) for two related reasons. First, firm size has often been used as a proxy for the amount of information that is publicly available about a firm. Relative to smaller firms, larger firms are typically more closely watched by the investment community and there is a greater amount of public information available. This implies that market participants can better assess the future performance of larger firms and that there would be smaller bias for larger firms. Therefore, we include the variable SIZE to ensure that our inferences regarding the association between predictability and forecast bias are not driven by firm size. Second, Bhushan (1989) finds that size and analyst following are related—larger firms are, on average, followed by more analysts than are smaller firms. If analyst following influences forecast bias, independent of size considerations, including SIZE increases the explanatory power of the regression by controlling for the component of analyst following that is highly correlated with size, but uncorrelated with forecast bias (Brown et al. 1987). As in Bhushan (1989), we use the logarithm of average year-end market value over the test period as our SIZE measure.

Interaction Variables (FOLLOWING*UNPRED and SIZE*UNPRED)

To the extent analyst following for a low predictability firm is systematically different from the analyst following for a high predictability firm, the influence of UNPRED on BIAS is likely to be systematically different for firms with different levels of analyst following. For example, the influence of UNPRED on BIAS could be lower for firms with greater analyst following because each individual analyst's incentive to engage in optimism

³ Performing the principal component analysis in this cross-sectional fashion restricts factor loadings to be the same for all firms. We make this restriction because we have only a few observations for each firm. This restriction adds noise to our construction of the measure for inherent earnings predictability that is likely to bias the results against finding the hypothesized association between predictability and forecast bias.

may be less pronounced. To capture such potential interactions, we include the interaction variable FOLLOWING*UNPRED. In a similar vein, if earnings predictability and firm size are related, then the influence of UNPRED on BIAS will vary with firm size. That is, if larger firms are, on average, more mature and thus have more predictable earnings than smaller firms, then the relationship between UNPRED and BIAS will be different across firm size. To capture this effect we introduce the variable SIZE*UNPRED into our analysis.

Value Line Stock Recommendations (TIMELY)

Using Value Line forecast data, Francis and Philbrick (1993) document that analysts are more likely to follow sell recommendations with subsequent forecasts that are more optimistic than the forecasts that follow buy or hold recommendations. They interpret this evidence as consistent with analysts using forecast optimism to repair management relations. To control for the portion of optimistic bias that may be driven by mending motives, we include the average timeliness ranking (TIMELY) issued by Value Line over the test period (1989–1993) as an explanatory variable. The Value Line timeliness ranking is an ordinal rank on a scale of 1 to 5, with 1 indicating a strong buy and 5 indicating a strong sell. However, we caution the reader that this measure is an approximate control, since the lagged nature of the association between the stock recommendation and the period-specific forecast bias is central to the Francis and Philbrick (1993) inquiry. We are unable to capture this lagged effect more appropriately because we measure systematic forecast bias as the mean forecast error over the test period.

IV. RESULTS

Table 2 provides descriptive statistics on key variables. Table 2 indicates that the average forecast error is negative (indicating optimism) for all four horizons.^{4,5} The percentage of observations with negative forecast errors is far greater than the percentage with positive forecast errors. In particular, approximately 60 percent of the observations are negative for Horizons 1 and 4, while approximately 70 percent of the observations are negative for Horizons 2 and 3. The null hypothesis that the average forecast error is zero is rejected for all four horizons.

The Pearson correlation coefficients (not reported in table 2) indicates that FOLLOWING and SIZE are highly, positively correlated ($\rho = 0.70$; $p < 0.01$), consistent with the results of Bhushan (1989). However, neither FOLLOWING nor SIZE are significantly correlated with the earnings predictability measure, UNPRED.

We estimate equation (1) using the mean of each variable over the test period (1989–1993) except for UNPRED. Recall that UNPRED is estimated using data from the measurement period (1983–1988; see previous section and the appendix). In doing so, we assume that predictability of firms remains unchanged from the measurement period to the test period (1989–1993). As described earlier, forecast bias (BIAS) is measured as the mean of the difference between actual earnings and analysts' forecasts over the test period.

⁴ We computed the forecast errors in a manner similar to Francis and Philbrick (1993), who examine undeflated forecast errors as well as forecast error as a percentage of actual earnings over the period 1987–1989. The mean and median forecast errors in our sample over a comparable horizon for this period is slightly higher (on average, across all four horizons, forecasts exceed actual earnings realizations by 25 cents per share or 15 percent of actual EPS) but of the same order of magnitude.

⁵ In computing the statistics for inference, we use a fixed-effects model similar to O'Brien (1988) to control for potential cross-sectional correlations in forecast errors induced by unanticipated time-period specific economy-wide shocks. We also purge out effects specific to Pharmaceutical, Machinery and Electrical, and Utilities, industries owing to sample concentration in these industries.

TABLE 2
Descriptive Statistics (computed for the period 1989–1993)
Sample size = 239–274 firms (1195–1370 firm-year observations)

<i>Variable Name^a</i>	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>	<i>Min.</i>	<i>Max.</i>	<i>% of Obs. with Negative Values</i>
ASSETS (\$ in millions)	8124	2144	22119	33	251506	NA
BIAS:						
Horizon 1	−0.030***	−0.005	0.141	−2.670	0.887	60.35†
Horizon 2	−0.035***	−0.007	0.127	−2.528	0.656	72.24†
Horizon 3	−0.027***	−0.004	0.122	−2.442	1.435	69.67†
Horizon 4	−0.015***	−0.001	0.093	−2.442	0.635	62.17†
UNPRED	−0.086	−0.126	0.173	−0.248	0.919	NA
FOLLOWING ^b	23	22	15	1	61	NA
SIZE (\$ in millions)	4073	1367	8037	12	89527	NA
TIMELY	3.109	3	0.826	1	5	NA

*** Significant at the one percent level. This significance is computed after controlling for potential cross-sectional correlation induced by period-specific economy-wide shocks. Specifically, a fixed-effect model incorporating an effect for each calendar year in the sample is used to purge year-specific effects in computing the significance statistic.

† Significant at the one percent level. Statistical significance is computed by assuming an unconditional probability of observing a negative forecast error of 0.5, and using the normal approximation to a binomial distribution.

^a Variable definitions:

ASSETS = total assets (Compustat data item #6).

BIAS = average signed forecast error, computed as actual EPS realization as reported by Value Line less forecast divided by year-end share. Horizon 1 refers to the time period between the date of the first Value Line forecast issued for a fiscal year and the end of that fiscal year. Horizons 2, 3 and 4 are defined similarly with respect to the first Value Line forecast issued after the end of the first, second and third fiscal quarters, respectively.

UNPRED = this variable is based on a principal component analysis using the absolute prediction errors for the period 1983–1988 from four time-series predictability metrics as factors. The principal component analysis is conducted cross-sectionally. For each firm, the first component scores are averaged over this period to yield a value for UNPRED. High values of UNPRED indicate that earnings are difficult to predict using time-series models. The time-series models are estimated using data from the period 1969–1982 (see the appendix for details).

FOLLOWING = average number of analysts following a given firm in the period 1989–1993, as reported in I/B/E/S summary tape.

SIZE = logarithm of the average market value of equity for the period 1989–1993. Market value of equity computed by multiplying year-end outstanding shares (Compustat data item #25) with closing share price (Compustat data item #24).

TIMELY = mean Value Line timeliness ranking over the test period (1989–1993). The Value Line timeliness ranking ranges from 1 to 5, with a rank of 1 representing a strong buy recommendation and a rank of 5 representing a strong sell recommendation.

Table 3 presents results from estimation of equation (1). The null hypothesis that the coefficient of UNPRED equals zero is rejected for all four horizons. As predicted, this coefficient is negative (at the five percent levels or below) in each horizon. This coefficient ranges from -0.076 in Horizon 1, to the most negative value of -0.135 in Horizon 3. The estimated coefficient of FOLLOWING is insignificant in all four horizons. The null hypothesis that the coefficient of SIZE equals zero is rejected for Horizons 3 and 4. A positive coefficient of SIZE in these horizons implies that forecast optimism is less for larger firms, which is consistent with the argument that there is less incentive for the analyst to engage in deliberate optimism for larger firms. The interaction term UNPRED*SIZE is not significant in any horizon. However, the interaction term UNPRED*FOLLOWING is significant in Horizons 3 and 4. Because the main effect of predictability on bias (as represented in the coefficient on UNPRED) and this interactive effect are opposite in direction, the overall effect of unpredictability on bias is not immediately clear for these two horizons. A closer examination of the results pertaining to Horizon 3 indicates that the incremental effect of

TABLE 3
Association Between Earnings Predictability and Analysts' Forecast Bias

$$\text{Regression: } \text{BIAS} = a_0 + a_1(\text{UNPRED}) + a_2(\text{FOLLOWING}) + a_3(\text{SIZE})$$

$$+ a_4(\text{UNPRED}*\text{FOLLOWING}) + a_5(\text{UNPRED}*\text{SIZE}) + a_6(\text{TIMELY}) + \varepsilon$$

<i>Independent Variable^a</i>	<i>Horizon 1</i>	<i>Horizon 2</i>	<i>Horizon 3</i>	<i>Horizon 4</i>
Intercept (a_0)	~ 0.000 (0.02) ^b	-0.017 (-0.69)	-0.024 (-1.06)	-0.024 (-1.27)
UNPRED (a_1)	-0.076 (-2.01)**	-0.124 (-3.25)***	-0.135 (-3.91)***	-0.128 (-4.54)***
FOLLOWING (a_2)	~ 0.000 (-0.32)	~ 0.000 (0.61)	~ 0.000 (0.32)	~ 0.000 (0.68)
SIZE (a_3)	0.003 (0.87)	0.005 (1.50)	0.007 (2.18)**	0.006 (2.20)**
UNPRED*FOLLOWING (a_4)	~ 0.000 (0.11)	0.002 (1.28)	0.003 (2.00)**	0.003 (2.56)**
UNPRED*SIZE (a_5)	0.001 ^c (0.61)	~ 0.000 (0.36)	~ 0.000 (0.09)	~ 0.000 (0.04)
TIMELY (a_6)	-0.017 (-2.67)***	-0.019 (-3.14)***	-0.018 (-3.07)***	-0.013 (-2.62)
R-squared	0.05	0.09	0.10	0.11
F-statistic	3.18***	5.07***	5.49***	6.07***
Observations	239	239	239	239

*, **, *** significant at ten, five and one percent levels, respectively.

^a All variables are as defined in table 2. The variable SIZE is used in logarithmic form.

^b t-statistic reported in parenthesis.

^c Times 10^{-3} .

predictability on bias is given by $-0.135 + 0.003 \cdot \text{FOLLOWING}$ (taking the partial derivative of equation (1) with respect to UNPRED for this horizon). The mean (median) value of this incremental effect is -0.064 (-0.069), which is negative and significant ($t = -22.86$, $p < 0.01$). Further, only 21 out of 239 sample firms show a positive incremental effect. Thus, the overall relationship between bias and predictability is negative. A similar argument holds for Horizon 4.

Because of the high degree of correlation between FOLLOWING and SIZE, we conduct collinearity diagnostics, which suggest that multicollinearity does not present a severe problem in our analysis.⁶ Finally, the null hypothesis that the coefficient of TIMELY equals zero is rejected for all four horizons. In particular, this coefficient is negative in all four horizons. Since a high value of TIMELY indicates "strong sell" recommendation, a negative coefficient on TIMELY suggests more pronounced (BIAS is more negative) forecast optimism for sell as opposed to buy recommendations. This finding is consistent with the results of Francis and Philbrick (1993).

We examine the impact of extreme observations on our results by winsorizing all variables at the 99th percentile level. Results are materially the same. We also examine how industry concentration affects our results. Referring to table 1, our sample is characterized by a concentration in Pharmaceuticals, Manufacturing and Utilities industries. Therefore, we allow both intercept as well as the slope coefficient of the variable UNPRED in equation (1) to be different for these three industries. The null hypothesis that the coefficient of UNPRED equals zero is rejected for all four horizons (at similar levels of significance as table 3). This coefficient ranges from -0.066 in Horizon 1, to a maximum of -0.131 in Horizon 3. The intercept and slope dummies corresponding to the Pharmaceutical and Utilities industries are not significantly different from zero for all four horizons, indicating that the association between BIAS and UNPRED for these industries is similar to that for the entire sample. For the manufacturing industry, both slope and intercept coefficients are significant and negative for all horizons except Horizon 1, which indicates that the negative association between BIAS and UNPRED is more pronounced for our sample firms in this industry.⁷

Overall, we find evidence consistent with the hypothesis that analysts' forecast bias is more pronounced for firms with less predictable earnings. This result provides empirical support to the notion that the accuracy of prediction based on publicly available past information is associated with the degree of optimism in analysts' forecasts. In the case of firms whose earnings can be reliably predicted (relatively speaking) from past information, analysts do not need to access information controlled by managers to improve accuracy. However, such is not the case for firms whose earnings cannot be reliably predicted by time-series models. For these firms, analysts have more impact on the market's expectations and may deliberately bias forecasts to build better management relations and, in turn, derive informational benefits. In the next section, we test the robustness of our results to alternative specifications of earnings predictability.

Alternative Earnings Predictability Measures

In the previous section, we measured earnings predictability using the historical time-series of earnings. In this section, we test the robustness of this result to alternative specifications of predictability.

⁶ The largest condition index of 19.69 is well below the upper bound of 30 (Belsey et al. 1980, 105).

⁷ The intercepts for the manufacturing industry are -0.014 ($t = -1.18$), -0.027 ($t = -2.33$, $p < 0.05$), -0.029 ($t = -2.79$, $p < 0.01$) and -0.023 ($t = -2.71$, $p < 0.01$) for Horizons 1, 2, 3 and 4, respectively. The corresponding slope coefficients are -0.066 ($t = -0.98$), -0.118 ($t = -1.74$, $p < 0.10$), -0.127 ($t = 2.07$, $p < 0.05$), -0.085 ($t = -1.71$, $p < 0.10$).

First, we include a security price-based metric as an additional factor in the principal component analysis, along with time-series-based metrics of the previous section. Security price movements in a period reflect information about current and future prospects, and such movements are public information that can be used to predict future earnings. Collins et al. (1987) demonstrate that the cumulative abnormal returns over a given year explain 59 percent of the variation in the percentage change in earnings in the next period. Based on this evidence, we use the change in the security price over a given period as the predictor for change in earnings in the subsequent period. Specifically, we estimate the following model:

$$\frac{CEPS_{t+1}}{|EPS_{t+1}|} = \gamma_0 + \gamma_{1t}PCPR_t + \kappa_{t+1}^j \quad (3)$$

where $CEPS_{t+1}$ is the change in earnings per share over period $t + 1$, the denominator is the absolute value of earnings, and $PCPR_t$ is the percentage change in price in period t (inclusive of period t dividends). Period t is defined from April 1 of year t , to March 31 of year $t + 1$. We chose this period to ensure that the returns reflect year t 's financial statement information for all firms (Elgers and Murray 1992). We estimate equation (3) on a firm-by-firm basis, using all data available prior to the period being predicted (i.e., from 1969 to year $t - 1$). Since our measurement period begins in 1983, we have a minimum of 13 observations for each regression. The parameter estimates are then used to arrive at the predicted change in EPS. The return model accuracy metric is computed for each year in the measurement period (1983–1988) as:

$$RMACC_t^j = \left| \frac{CEPS_t^j}{EPS_t^j} - RETPRED_t^j \right|, t = 1983, \dots, 1988. \quad (4)$$

where $CEPS$ is the actual change in EPS and $RETPRED$ is the predicted change in EPS using the return model given by equation (3). This measure is included as an additional factor in the principal component analysis used to construct the $UNPRED$ variable (see section III and the appendix). The analysis of table 3 is then repeated using this $UNPRED$ construct. Results are qualitatively the same as in table 3 and therefore not reported.

A second candidate for measuring a firm's predictability is the Value Line predictability ranking. Value line constructs a firm-specific index of predictability that ranges from 5 to 100 (unpredictable to predictable). If the Value Line predictability ranking measures the extent to which analysts can benefit from developing relations with firms' management, then there is likely to be a positive association between the predictability ranking and the extent of forecast bias. A limitation in using the Value Line predictability ranking is that these rankings vary from year to year for some firms. For consistency with our previous analysis, we calculate $UNPREDV$ as 100 minus the average Value Line predictability ranking over the test period (1989–1993). Then, using $UNPREDV$ as a measure of predictability, we hypothesize a negative relationship between $UNPREDV$ and forecast bias. Table 4 presents the results replicating our analysis, using $UNPREDV$ in place of the earlier $UNPRED$ measure.

The explanatory power of the regressions is much higher with the Value Line predictability measure as indicated by higher adjusted R-squared values in table 4 relative to table 3. The results in table 4 are, however, subject to the caveat that the Value Line predictability ranking itself is a *reported* measure, and is potentially subject to strategic behavior.

Table 4 indicates the same, strong negative association between bias and predictability for all four horizons that is displayed in table 3. Thus, the major finding of a negative

TABLE 4
Association Between Value Line Based Earnings Predictability and Analysts' Forecast Bias

$$\text{Regression: } \text{BIAS} = a_0 + a_1(\text{UNPREDV}) + a_2(\text{FOLLOWING}) + a_3(\text{SIZE}) \\ + a_4(\text{UNPREDV} * \text{FOLLOWING}) + a_5(\text{UNPREDV} * \text{SIZE}) + \varepsilon$$

<i>Independent Variable^a</i>	Horizon 1	Horizon 2	Horizon 3	Horizon 4
Intercept (a_0)	0.043 (1.61) ^b	0.054 (2.07)***	0.046 (1.87)*	0.037 (1.79)*
UNPREDV (a_1)	-0.001 (-4.41)***	-0.001 (-6.24)***	-0.001 (-5.76)***	-0.001 (-5.15)***
FOLLOWING (a_2)	-0.001 (-1.04)	-0.001 (-1.11)	-0.001 (-1.38)	-0.001 (-1.76)*
SIZE (a_3)	0.001 (0.26)	0.001 (2.09)**	0.002 (0.61)	0.002 (0.72)
UNPREDV * FOLLOWING (a_4)	0.009 ^c (1.22)	0.010 ^c (2.09)**	0.014 ^c (2.11)**	0.016 ^c (2.86)**
UNPREDV * SIZE (a_5)	~-0.000 (-0.93)	~-0.000 (-0.50)	~-0.000 (-0.16)	~-0.000 (-0.21)
TIMELY (a_6)	-0.010 (-0.93)	-0.012 (-1.95)**	-0.011 (-1.91)***	-0.009 (-1.84)*
R-squared	0.16	0.26	0.22	0.14
F-statistic	8.45***	14.94***	12.18***	7.5***
Observations	239	239	239	239

*, **, *** significant at ten, five and one percent levels, respectively.

^a Variable definitions:

UNPREDV = 100 - mean Value Line predictability score over the test period (1989-1993). We subtract the Value Line predictability score from 100 to make the sign of UNPREDV consistent with the sign of UNPRED in table 3.

All other variables are defined in table 2.

^b t-statistic reported in parenthesis.

^c Times 10^{-3} .

association between bias and predictability is robust to different measures of predictability. The coefficient on the variable TIMELY is also negative and significant in three of four horizons while it is negative and significant in all four horizons in table 3. The null hypothesis that the coefficient of SIZE is zero is rejected for only Horizon 2 in table 4, but for Horizons 3 and 4 in table 3. The null hypothesis that the coefficient on UNPREDV * FOLLOWING is zero is rejected for Horizons 2, 3 and 4 in table 4, while the coefficient on the related interaction term in table 3 is significant in two of the four horizons. As in table 3, the main effect and interactive effect are in opposite directions. An analysis similar to that presented for table 3 indicates that the *overall* relationship between UNPREDV and BIAS is negative.

Predictability vs. Variability

Earnings variability and earnings predictability conditioned on public information are distinct concepts.⁸ Consider an earnings stream with a large seasonal component. Although earnings may be highly variable, they are easy to predict with knowledge of the seasonal pattern. Nonetheless, we note that predictability and variability are likely to be associated and we examine whether variability, rather than predictability, may be driving our results. We measure earnings variability as the coefficient of variation of the change in annual earnings using the entire history of annual earnings before the test period (i.e., the period 1969–1988).⁹ The Pearson correlation coefficient between UNPRED (as used in table 3) and variability is 0.32. This correlation suggests that predictability and variability are related. However, variability shows no association with BIAS in any of the four horizons. The Pearson correlations between variability and BIAS at horizons 1, 2, 3 and 4 are 0.03, -0.01, -0.01 and -0.01, respectively. This correlation structure provides assurance that forecast bias is not a statistical artifact of cross-sectional differences in variability. We also include the coefficient of variation variable as an explanatory variable in the basic regression model. The results remain qualitatively the same as in table 3.

V. CONCLUSIONS AND LIMITATIONS

Research to date on financial analysts' forecasts of earnings suggests that analysts, on average, are optimistic. In this paper, we examine whether the predictability of earnings based on past information is a determinant of the cross-sectional differences in forecast bias. The motivation for examining such a relationship is based on the premise that if market participants can form relatively accurate expectations independent of analysts' forecasts, analysts gain little by issuing deliberately biased forecasts. On the other hand, firms characterized by low earnings predictability offer the greatest opportunities to improve upon the market's earnings expectations. Thus, we hypothesize that analysts have greater incentives to seek and acquire non-public information for low predictability firms. If issuing biased forecasts facilitates such information acquisition, analysts will overstate earnings more for firms that are hard to predict using publicly available information. Consistent with this hypothesis, we find that analysts' forecasts contain significantly more bias for low predictability firms. This result is robust to the choice of several alternative measures of the earnings predictability.

One limitation of our study is the assumption implicit in our demand-based argument that the inherent predictability of firms is stationary over time. This assumption underlies our use of the time-series-based predictability measure, UNPRED. We have no reason to believe that a violation of this assumption would affect the association between bias and predictability in any systematic way, but is likely to result in a noisier measure of predictability. However, we note that our hypothesis is still supported when we use the Value Line predictability measure, UNPREDV, which is not subject to stationarity concerns. A second limitation of our study is the potential impact of survivorship bias. Only surviving firms make it into our sample because we require a long time-series of earnings for our analysis. Thus, our analysis may not generalize to non-surviving firms.

⁸ In our sample, Hilton Hotels (CUSIP = 432848) exhibits high predictability and high variability. In contrast, Monsanto Co. (CUSIP = 611662) exhibits low predictability (as measured by UNPRED), but high variability.

⁹ The absolute value of the coefficient of variation is simply the standard deviation scaled by the absolute value of the mean.

APPENDIX

In this appendix, we provide a detailed description of how we estimate the predictability (UNPRED) measure.

We employ the following time-series models.

Annual models:

$$\text{Annual Random Walk: } A_t = A_{t-1} + \varepsilon_{1t}$$

$$\text{Submartingale Model: } A_t = A_{t-1} + C_t + \varepsilon_{2t}$$

$$\text{Autoregressive Model: } A_t = \phi_0 + \phi_1 A_{t-1} + \varepsilon_{3t}$$

Quarterly models:

$$\text{Seasonal Random Walk: } Q_t = Q_{t-4} + \varepsilon_{4t}$$

$$\text{Foster Model: } Q_t - Q_{t-4} = \phi_3(Q_{t-1} - Q_{t-5}) + \varepsilon_{5t}$$

where A_t and Q_t represent annual earnings per share and quarterly earnings per share for year/quarter t , respectively, C_t is the average growth in EPS computed over years $t - 5$ to $t - 1$, and the error terms represent white noise. As in O'Brien (1988), these quarterly models are chosen because of their relative simplicity.

To obtain predictions for a given year t , we estimate the various parameters using all available data from 1969 to year $t - 1$. For example, to predict the annual earnings for the year 1983, the first year in our measurement period, we use the time-series of earnings from 1969 to 1982 to estimate the annual models (minimum of 14 years), and from 1979 to 1982 to estimate quarterly models (minimum of 12 quarters). We construct predictions for annual earnings from quarterly models by aggregating the realized earnings of elapsed quarters in the year and the predictions for the remaining quarters.

Based on the above time-series models, we develop predictions over four horizons: the annual horizon (Horizon 1), and horizons spanning the last three, two and one quarters (Horizons 2, 3 and 4) respectively. Since Horizon 1 forecasts are issued before the end of the first fiscal quarter, we estimate three annual models and two quarterly models for Horizon 1. However, Horizons 2, 3 and 4 forecasts are issued after the release of first, second and third quarters, respectively. Therefore, we use only quarterly models for these horizons. We use the period from 1983 to 1988 (the *measurement* period) to estimate earnings predictability over each of these horizons and then develop a composite measure. The measurement period is distinct from the *test* period (1989–1993) we use to examine the association between predictability and forecast bias.

For each time-series model, we calculate the standardized absolute prediction error metric as:

$$TSACC_{nt}^j = \frac{|A_t^j - TS_{nt}^j|}{P_t^j} \quad \text{for } n = \{1, 2, 3, 4\}$$

where A_t^j is the actual earnings realization for year t , firm j , TS_{nt}^j is the time-series prediction for year t , firm j and horizon n , and P_t^j is the year end share price for year t , firm j . For each time-series model, we compute the mean accuracy over the measurement period (1983–1988), $MTSACC_n^j$, as:

$$\text{MTSACC}_n^j = \frac{1}{6} \sum_{t=83}^{t=88} \text{TSACC}_{nt}^j.$$

Note that there are 11 measures of MTSACC for each firm, five for Horizon 1 from the three annual time-series models, two each for Horizons 2, 3 and 4 from the two quarterly models. We use the "best" time-series model for each horizon as identified by the smallest value of MTSACC for that horizon. This procedure gives us the one time-series model for each firm over each horizon that best approximates the time-series of earnings from among the models we have considered.

Next, using a principal component analysis, we seek a linear combination of time-series prediction errors over the four horizons that best captures the correlated component amongst them. In particular, to derive this principal component, we use the time-series prediction errors (TSACC) for the period 1983 to 1988, using the model chosen for each of the four horizons for a given firm.¹⁰ Correlations among these prediction errors are highly positive and significant, and range from 47 to 95 percent. We pool data (in the period 1983 to 1988) across firms to compute the weights.¹¹ The principal component analysis yields the following linear combination for the first principal component (suppressing the firm subscript).

$$\begin{aligned} \text{FIRSTCOMP}_t &= 0.51(\text{TSACC}_{1t}) + 0.41(\text{TSACC}_{2t}) \\ &+ 0.54(\text{TSACC}_{3t}) + 0.53(\text{TSACC}_{4t}). \end{aligned}$$

We note that FIRSTCOMP_t is standardized to have mean zero and unit variance, and accounts for 81 percent of the total variation in the original variables.¹²

Then, we calculate firm j 's inherent predictability as the mean of its first principal component scores:

$$\text{UNPRED}^j = \frac{1}{6} \sum_{\tau=1}^6 \text{FIRSTCOMP}_{\tau}^j.$$

¹⁰ Thus, it is possible that for a given firm, different time-series models may be chosen for different horizons in deriving the principal component.

¹¹ While it would be ideal to conduct this analysis at the firm level, we have only six observations (for the period between 1983 to 1988) for each firm.

¹² In contrast, the second principal component, which by design is orthogonal to the first component, explains only 15 percent of the remaining variation.

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BOOK REVIEWS

Thomas H. Williams, Editor

Editor's Note: Two copies of books for review should be sent to Professor Thomas H. Williams, McIntire School of Commerce, University of Virginia, Charlottesville, VA 22903-2493. The policy of *The Accounting Review* is to publish only those reviews solicited by the Book Review Editor. Unsolicited reviews will not be accepted.

FREDERICK D. S. CHOI, Editor, *International Accounting and Finance Handbook*, Second Edition (New York: John Wiley & Sons, Inc., 1997, pp. xviii, 1115, \$145.00).

This handbook is a substantial revision of Professor Choi's 1991 *Handbook of International Accounting* (see *The Accounting Review*, Vol. 76, No. 3 (1992): 634, for a review of the prior edition). Like the first edition, this volume provides a wide variety of essays by leading scholars and practitioners on various aspects of international accounting and financial management. Its coverage of issues in multinational financial reporting and financial statement analysis has been quite competently updated to cover the extensive efforts at international harmonization pursued by the International Accounting Standards Committee (IASC) and the International Organization of Securities Commissions (IOSCO) over the past six years. This edition of the *Handbook* further warrants its expanded title (including *Finance*) due to a major revision of its section on Financial Management and Control Issues. Nine new chapters, the majority focusing on issues of risk management, have been added to this section of the text.

As indicated by its title, this book is clearly a *Handbook* usable in a wide range of environments, not a textbook suitable for any particular academic course. The range of readers who might find it useful is, however, quite broad. Given its blend of theoretical (academic), public policy and private practice perspectives, it is hard to visualize any student or practitioner of global financial reporting or management who would not find it to be a useful reference tool. Its various chapters provide useful descriptions of evolving forms of financial instruments, detailed illustrations of the application of recently issued national (FASB, et al.) and international (IASC) financial accounting standards, discussions of remaining problems in comparability when analyzing financial statements from multiple national reporting regimes, numerous practical suggestions in the multinational management of financial risks, and broad perspectives on the future evolution of global financial reporting systems. It could, thus, be used as a reference work by advanced students in accounting and finance, as well as a source for outside readings assigned in advanced courses in these areas. Professionals working in the area of international financial management could clearly also benefit from access to its contents. The *Handbook's* use in either academic or practice environments is facilitated by a quite usable and comprehensive topical index (15 pages).

It should be noted, however, that despite its broad (and relatively deep) coverage of topics in finance and accounting, this edition of the *Handbook* retains a decidedly "first world" orientation. Extensive coverage of conditions in OECD countries (e.g., the U.S., U.K., France, Germany and Japan) is not matched by attention to conditions in emerging and developing national economies (e.g., China and Russia). While the majority of the potential users of such a book in North America and Western Europe would not find such geographical "incompleteness" troublesome, it does limit the *Handbook's* usefulness in certain environments.

Overall, this book is a unique, up-to-date and readily usable reference tool for both academic and practitioner audiences interested in multinational financial reporting and management. It should definitely be included in

libraries which serve the needs of these audiences. Its cost, nonetheless, may prove prohibitive for its inclusion in private professional collections.

JOHN W. EICHENSEHER
Professor of Accounting

University of Wisconsin-Madison

F. L. CLARKE, G. W. DEAN, AND K. G. OLIVER, *Corporate Collapse: Regulatory, Accounting and Ethical Failure* (Melbourne: Cambridge University Press, 1997, pp. xx, 294).

The theme of this book on corporate collapses in Australia is that conventional corporate financial accounting does not, and cannot, serve the needs of users of financial statements. Furthermore, the rash of failures is evidence that radical reform of accounting reporting is necessary. The authors examine nine unexpected corporate failures in Australia from the 1960s–1980s to ascertain why existing accounting standards did not reflect the true financial condition of the companies. The authors' central tenet is that the use of historical cost and consolidated accounting precludes accounting financial statements from providing a true and fair view of the enterprise, particularly its wealth and performance measured in money terms. The authors argue that the failure of corporate financial statements to reflect the true financial condition is not caused by misapplication of conventional accounting standards (creative accounting). Rather, they argue that conscientious application of the "cookbook" of existing accounting standards necessarily leads to misleading financial statements.

The bulk of the book is an exhaustive examination of nine Australian corporate failures and reasons why the conventional accounting practices did not reflect the upcoming collapse. The authors examine three companies that collapsed in the 1960s (Reid Murray Holding, Stanhill Pty Ltd., and H. G. Palmer) and find two systemic accounting failures. First, reporting book values, rather than money value (i.e., mark-to-market accounting), allowed excess borrowing. Second, the group or consolidated accounting for entities comprised of both private and public firms allowed firms to mask the losses of poorly performing public subsidiaries within the group.

The accounting regulatory boards in Australia responded to the collapses of the 1960s by prescribing still more accounting standards. The authors argue that merely complying with more and more accounting standards is not the solution because those standards are based on irrelevant and misleading historical cost. The authors describe three collapses in the 1970s (Mineral Securities, Cambridge Credit, and Associated Securities). In the case of both Mineral Securities and Associated Securities, reliance on existing historical cost accounting led to severely overstated book values for physical assets, and illustrate, the authors contend, the need for mark-to-market accounting. The failure of Cambridge Credit came as a surprise to users of financial statements, due, the authors assert, to the inability of current group or consolidated accounting to report the results of related companies in "Byzantine" family structures. The failures of consolidated accounting are discussed in further detail in the discussion of corporate and accounting failures in the 1980s.

The book describes the accounting inadequacies related to the failures of Adsteam, Bond Corporation, and Westmex in the 1980s. All three corporations were complex groups of related companies with many related-party transactions. The authors argue that the complexity of the organizations and the ability to thread assets in a "round robin" fashion through the entity made conventional profit and loss calculations misleading, if not impossible.

The last chapters of the book outline the authors' suggestions for change. They consider consolidated financial statements as worse than irrelevant and argue that such statements should be considered "financial hazards." They argue that there is no economic reason for companies to have subsidiaries rather than divisions or branches; instead, they assert, companies choose the consolidated form in order to hide behind consolidated reports. The authors suggest that regulators, at best, should bar the use of the consolidated form of business and reporting, and, at least, require disaggregation of group assets at market values. They also argue that since the purpose of corporate financial statements is to provide information on the money value of the corporation and its performance, financial statements should be restated in order to reflect true purchasing power gains and losses every period.

In summary, *Corporate Collapse* argues that the wave of corporate failures is strong evidence that conventional accounting has failed and is no longer useful or "serviceable." The authors argue that it is not the misuse of current accounting standards by unscrupulous or creative accountants that is the problem. Instead, the requirement to use a myriad of acceptable financial practices and the reliance on historical cost to report complex consolidated entities is the real problem. The authors conclude that the essence of financial accounting is to report a true and fair view of the company based on financial reality rather than on a cookbook of accounting rules. They argue for inflation-adjusted, disaggregated financial reports. They conclude that since we as a profession know, or should know, that the problems of accounting cannot be fixed simply by prescribing more rules, the entire standard-setting process may be unethical in itself.

The authors write in a refreshingly non-academic style and make strong arguments for their positions. In particular, their arguments for marking-to-market and disaggregation of assets is particularly persuasive to an American reader given the recent developments in U.S. GAAP. The book should prove to be especially interesting for teachers of advanced accounting and accounting theory and policy courses. However, in the reviewer's opinion, the book is limited by the presumption that financial statements can be made to reflect true value every period. The solutions offered by the authors remind this reviewer of the requirements of the ill-fated FAS No. 33 for inflation accounting.

KEVIN T. STEVENS

Associate Professor of Accountancy

DePaul University

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Editorial Data

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$61 \leq \text{Days} \leq 90$	142	190	68.5
$91 \leq \text{Days} \leq 120$	69	259	93.5
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The Expected Rate of Return on Pension Funds and Asset Allocation as Predictors of Performance

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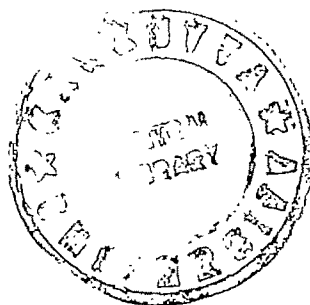
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Rate-Regulated Enterprises and Mandated Accounting Changes: The Case of Electric Utilities and Post-Retirement Benefits Other than Pensions (SFAS No. 106)



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The Influence of Institutional Investors on Myopic R&D Investment Behavior

Brian J. Bushee
Harvard University

ABSTRACT: This paper examines whether institutional investors create or reduce incentives for corporate managers to reduce investment in research and development (R&D) to meet short-term earnings goals. Many critics argue that the frequent trading and short-term focus of institutional investors encourages managers to engage in such myopic investment behavior. Others argue that the large stockholdings and sophistication of institutions allow managers to focus on long-term value rather than on short-term earnings. I examine these competing views by testing whether institutional ownership affects R&D spending for firms that could reverse a decline in earnings with a reduction in R&D. The results indicate that managers are less likely to cut R&D to reverse an earnings decline when institutional ownership is high, implying that institutions are sophisticated investors who typically serve a monitoring role in reducing pressures for myopic behavior. However, I find that a large proportion of ownership by institutions that have high portfolio turnover and engage in momentum trading significantly increases the probability that managers reduce R&D to reverse an earnings decline. These results indicate that high turnover and momentum trading by institutional investors encourages myopic investment behavior when such institutional investors have extremely high levels of ownership in a firm; otherwise, institutional ownership serves to reduce pressures on managers for myopic investment behavior.

This paper is based on my dissertation and was formerly entitled "Institutional Investors, Long-Term Investment, and Earnings Management." I would like to thank my committee members, Jeff Abarbanell, Doug Skinner, Gautam Kaul and Phil Howrey for their invaluable guidance and support. I also thank the following for their helpful comments and suggestions: Greg Miller, Ilia Dichev, Michael Eames, Paul Healy, Amy Hutton, Marco Iansiti, Marilyn Johnson, Bjorn Jorgensen, Russell Lundholm, Marlene Plumlee, Nancy Rothbard, Jim Wahlen, two anonymous reviewers, and workshop participants at the University of California at Berkeley, the University of Chicago, Columbia University, Cornell University, Dartmouth University, Duke University, Harvard University, the University of Michigan, the University of North Carolina, Northwestern University, the University of Pennsylvania, the University of Rochester, the University of Texas at Austin, Washington University, and the 1998 Midwest AAM Meeting. I gratefully acknowledge the financial support of the Coopers & Lybrand Foundation, the National Doctoral Fellowship Program, and the William A. Paton Scholarship Fund.

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Data Availability: *All data are available from public sources.*

I. INTRODUCTION

Over the past decade, many critics have expressed concerns that myopic investment behavior by U.S. corporate managers has caused U.S. firms to fall behind German and Japanese firms in terms of competitiveness and technological development (Jacobs 1991, 7–8; Porter 1992, 5–6; Lavery 1996, 825). Myopic investment behavior (or “managerial myopia”) refers to underinvestment in long-term, intangible projects such as research and development, advertising, and employee training for the purposes of meeting short-term goals (Porter 1992, 3–5). In this paper, I examine managerial myopia with respect to research and development (R&D) investment because lagging U.S. investments in R&D have triggered much of the concern over managerial myopia and because prior research provides some evidence that managers use R&D to meet earnings goals (Jacobs 1991, 3; Dechow and Sloan 1991). U.S. accounting rules require that R&D expenditures be immediately and fully expensed. Critics argue that this accounting treatment creates the managerial myopia problem because the U.S. capital markets have a short-term focus that creates pressure on managers to sacrifice R&D to maintain short-term earnings growth (Drucker 1986; Jacobs 1991, 36; Porter 1992, 24).

A widely cited source of this pressure is the frequent trading and fragmented ownership of institutional investors.¹ By acting as “traders” rather than “owners,” institutional investors allegedly place excessive focus on short-term developments, leading managers to fear that an earnings disappointment will trigger large-scale institutional investor selling and result in a temporary undervaluation of the firm’s stock price (Graves and Waddock 1990, 76–77; Jacobs 1991, 37–38; Porter 1992, 43–46). However, this view of institutional investor behavior is not universal. Others argue that the large stockholdings and sophistication of institutional investors allow them to monitor and discipline managers, ensuring that managers choose investment levels to maximize long-run value rather than to meet short-term earnings goals (Monks and Minow 1995, chap. 2; Dobrzynski 1993). This paper tests these two competing views by examining whether institutional investors create or reduce pressures on managers to reduce investment in R&D to meet short-term earnings goals.

Myopic investment behavior is a type of earnings management that is most likely to happen when managers face a trade-off between meeting earnings targets and maintaining R&D investment. To capture this context, I select a sample of firms with pre-R&D earnings that are below the prior year’s level, but by an amount that could be reversed by reducing R&D. For these firms, I test whether the level of institutional ownership affects the likelihood that managers cut R&D to reverse the expected earnings decline, controlling for other motivations to cut R&D (e.g., changes in the firm’s set of profitable R&D opportunities). The results indicate that managers are more likely to reduce R&D expenses, and hence boost earnings toward last year’s level, when institutional ownership is low. This result

¹ As defined by the SEC in Rule 13-f, institutional investors are entities such as bank trusts, insurance companies, mutual funds, and pension funds that invest funds on the behalf of others and manage at least \$100 million in equity. Entities such as arbitrageurs, brokerage houses, and companies holding stock for their own portfolio (as opposed to in their pension funds) are not considered institutional investors by the SEC and are not required to disclose their equity investments under Rule 13-f (Wines 1990).

suggests that institutional investors are sophisticated investors who typically fulfill a monitoring role in reducing incentives to manage earnings with cuts in R&D.

The absence of evidence that institutional ownership, as a whole, encourages myopic investment behavior does not preclude the possibility that predominant ownership by certain groups of institutions could increase incentives for managerial myopia. I classify institutions into groups based on their past investment behavior to test whether institutions with short (long) investment horizons encourage (discourage) myopic investment behavior. The results indicate that predominant ownership by "transient" institutions—which have high portfolio turnover and engage in momentum trading strategies (i.e., buy (sell) firms with good (bad) earnings news)—significantly increases the likelihood that managers cut R&D to manage earnings. This result supports the assertion that heavy institutional trading based on current earnings leads to myopic investment behavior by corporate managers, but only when institutions exhibiting such behavior have concentrated ownership positions.

These findings contribute to the literature on the relation between a firm's ownership and its investment in R&D. Prior research in this area tests for systematic underinvestment in R&D by examining the cross-sectional relation between the level of R&D intensity (e.g., R&D-to-sales) and the level of institutional holdings. The evidence on this relation is mixed, though largely supporting a positive association between R&D intensity and the percentage of institutional holdings (Graves 1988; Baysinger et al. 1991; Hansen and Hill 1991; Wahal and McConnell 1997). I extend this line of inquiry by testing for period-specific underinvestment in R&D in years when managers face a trade-off between maintaining R&D and meeting earnings targets. In doing so, I present evidence that the relation between institutional ownership and changes in R&D differs depending on the firm's current earnings performance.

This paper also contributes to recent research focusing on the influence of institutional investors on earnings management. Rajgopal and Venkatachalam (1997) present evidence consistent with greater institutional ownership reducing the incidence of a lower-cost form of earnings management: discretionary accruals. I focus on a more costly means of earnings management, R&D cuts, which have real implications for long-term value and, therefore, are of greater concern to equity holders like institutional investors. In a sample of the top 100 R&D spenders among NYSE/AMEX manufacturing firms, Bange and De Bondt (1997) find that greater institutional ownership is negatively associated with unexpected changes in R&D that reduce the anticipated gap between analysts' earnings forecasts and reported net income. I provide evidence that this relation holds for a broader set of firms and that the relation specifically holds for firms that reduce R&D to increase earnings. I also extend this research by providing evidence that ownership by different groups of institutional investors has differential influences on the use of R&D to manage earnings.

Finally, this paper makes two methodological contributions. First, prior research examining the use of R&D to manage earnings generally relies on simple proxies, such as industry changes in R&D, for nondiscretionary changes in R&D (Dechow and Sloan 1991; Holthausen et al. 1995). I use prior work on the determinants of R&D spending to develop a more extensive model for the firm's set of profitable R&D opportunities and the costs of reducing R&D to manage earnings, leaving an unexplained portion that is more likely to capture the changes in R&D resulting from earnings management. Second, this study introduces a methodology by which institutional investors can be parsimoniously classified into groups based on past portfolio behavior (e.g., trading frequency, level of diversification). By classifying directly on such characteristics, this approach creates more homogeneous groups of institutions and allows for richer predictions than the classification of

institutions by type (e.g., pension funds, mutual funds) commonly used in prior research (Lang and McNichols 1997).

The next section develops hypotheses by examining arguments for how the behavior of institutional investors influences managerial incentives to engage in myopic R&D investment behavior. Section III presents the methodology used in the empirical tests. Section IV describes the sample and presents descriptive statistics. Section V reports results of the empirical tests for institutional ownership as a whole, and Section VI reports results for ownership by different groups of institutions. Section VII presents a summary and conclusions.

II. HYPOTHESIS DEVELOPMENT

Short-Term-Oriented Institutional Investor Behavior and Managerial Myopia

The first hypothesis tests the view that the short-term focus of institutional investor trading creates incentives for myopic investment behavior. This view argues that managers have incentives to reduce R&D in order to avoid an earnings disappointment that would trigger large-scale institutional investor selling and lead to a temporary misvaluation of the firm's stock price (Graves and Waddock 1990, 76–77; Jacobs 1991, 37–38; Porter 1992, 43–46). This hypothesis requires that (1) managers have incentives to avoid temporary misvaluations and (2) institutional investor trading is sensitive to current earnings news and can cause a temporary misvaluation.

Prior research identifies two conditions necessary to create incentives for myopic investment behavior to avoid temporary misvaluations (Stein 1988, 1989). First, managers must place enough weight on current stock price so that they would not be willing to “ride out” a temporary misvaluation. Such concern over current stock price could be driven by (1) stock-based compensation and the need to make liquidity trades, (2) near-term equity funding requirements, (3) the threat that a raider will exploit a temporary undervaluation, or (4) the time horizons of influential investors (Froot, Perold, and Stein 1992, 50–55). Second, managers must believe there is a potential for misvaluation based on current earnings, either through market overreactions to unmanaged earnings declines or through market underreactions to reductions in valuable R&D that artificially boost earnings. Support for this condition is provided by Bernard et al. (1993), who cite anecdotal evidence that managers believe the market is capable of overreacting to earnings news.

The presence of institutional investors increases the perceived potential for misvaluation if they trade heavily based on current earnings news and if such trading causes misvaluations. Prior research provides evidence supporting both of these conditions. Lang and McNichols (1997) find that institutional trading is sensitive to earnings news, even after controlling for return movements. Other studies report that increased institutional ownership is associated with higher trading volume and stock return volatility around quarterly earnings announcements, as well as temporary undervaluations after spin-offs (Kim et al. 1997; Potter 1992; Brown and Brooke 1993).² Such heavy institutional investor trading in response to reported earnings could result from several market frictions. First, institutions subject to strict fiduciary responsibilities have incentives to sell stocks with declining earnings because fund sponsors and the courts use earnings as an objective criterion to judge the prudence of an investment (Badrinath et al. 1989). Second, institutional investors sometimes use

² Eames (1997) reports that annual changes in institutional ownership do not affect earnings response coefficients (ERCs) in a manner consistent with institutional trading leading to earnings-based misvaluations. However, in using annual data, his study does not capture the effect of institutional trading on ERCs in the days or weeks surrounding earnings announcements, when trading-based misvaluations are most likely to occur.

current earnings as a “value proxy” in their trading decisions due to an information asymmetry surrounding the quality of R&D spending (Froot, Perold, and Stein 1992, 55–56; Porter 1992, 43). This asymmetry could arise if institutions have short expected holding periods and focus on predicting near-term price movements instead of valuing long-term prospects (Froot, Scharfstein, and Stein 1992; Porter 1992, 43). Also, if institutions hold diversified portfolios with numerous stocks and small stakes in each, research on the long-term prospects of each is less cost-effective (Froot, Perold, and Stein 1992, 56; Porter 1992, 43).

These arguments for the extreme sensitivity of institutional investor trading to current earnings news support the hypothesis that, relative to individual investors, institutional investors create a short-term-oriented environment that encourages managers to manipulate earnings through investment cuts:³

H1a: *Ceteris paribus*, a higher percentage of institutional holdings in a firm increases the likelihood that its manager cuts R&D to meet short-term earnings goals.

Sophisticated Institutional Investor Behavior and Managerial Myopia

The competing hypothesis tests the view that the sophistication and large stockholdings of institutional investors remove incentives for myopic investment behavior by providing a higher degree of monitoring of managerial behavior. This monitoring can occur either explicitly, through governance activities, or implicitly, through information gathering and correctly pricing the impact of managerial decisions. Institutions that invest in firms with the intention of holding substantial ownership blocks over a long horizon have strong incentives to incur the cost of explicitly monitoring managers and ensure the firm does not cut profitable R&D to meet short-term earnings goals (Dobrzynski 1993; Monks and Minow 1995, chap. 2). The positive impact of such institutional monitoring is documented by Opler and Sokobin (1997), who present evidence that poorly performing firms targeted by the Council of Institutional Investors for shareholder activism have substantially improved profitability, greater asset divestitures, and reduced acquisition activity in subsequent years.

Sophisticated institutional investors can implicitly monitor managerial investment behavior by gathering information concerning the quality of R&D, thereby reducing the opportunities of managers to prevent a negative market reaction to an expected earnings decline through cuts in R&D. Hand (1990) uses institutional ownership to proxy for the type of sophisticated investor that would not be “functionally fixated” on earnings (i.e., focusing only on reported earnings and being misled by firms’ accounting choices). Schipper (1989, 98) argues that:

Concentrated user groups with substantial financial sophistication, material sums at stake, and no contractual friction to inhibit their behavior are, for example, likely candidates for undoing earnings management.

Considering the size of their investments and their use of buy-side analysts, institutional investors could fit this example and serve to remove incentives for myopic investment behavior.

³ Following Lang and McNichols (1997, 31), I assume that the other major category of investors in firms is individual investors. Other possible ownership groups include insiders, arbitrageurs and corporations making strategic investments. Agrawal and Knoeber (1996) find that the level of institutional holdings in a firm is not significantly associated with the level of insider holdings and is weakly negatively associated with large (greater than 5 percent) blockholders (which would include strategic corporate investments). Thus, institutional ownership likely does not proxy for the level of ownership by these types of investors.

This view of the sophistication of institutional ownership leads to the competing hypothesis that, relative to individual investors, institutional investors serve a monitoring role that reduces managerial incentives to sacrifice R&D to meet current earnings goals:

H1b: *Ceteris paribus*, a higher percentage of institutional holdings in a firm *decreases* the likelihood that its manager cuts R&D to meet short-term earnings goals.

The Influence of Different Groups of Institutional Investors on Managerial Myopia

Hypotheses 1a and 1b concern the impact of aggregate institutional ownership. Because institutional investors differ in their behavior and incentives, I examine whether certain groups of institutions influence myopic investment behavior in a manner different from the finding for overall institutional ownership. This examination is motivated by the growing importance of investor relation activities within firms and the increase in the number of consulting firms offering institutional investor targeting services. These trends indicate that managers not only know their investor base, but perceive differences in the ownership behavior of institutions and sometimes actively target certain types of institutions as investors (Anand 1991; Elgin 1992).⁴ Lang and McNichols (1997) group institutions based on their type (e.g., investment advisers, bank trusts, pension funds) and find significant differences in portfolio turnover and earnings-based trading. To account for the possibility that there can be substantive differences in trading and governance behavior within types of institutions, I classify institutional investors into groups using the specific characteristics of institutional investor behavior that have been argued to increase the pressure on managers to manipulate earnings. This approach classifies institutions into three groups—transient, dedicated and quasi-indexer—based on their past investment patterns in the areas of portfolio turnover, diversification, and momentum trading.⁵

Porter (1992, 42–46) argues that pressures for myopic investment behavior are created by “transient” institutional owners, who hold small stakes in numerous firms and trade frequently in and out of stocks, generally basing their trades on a value proxy such as current earnings. The short-term focus of transient institutions makes them the most likely group to sell out of a firm with disappointing earnings news, creating incentives for managers to avoid earnings disappointments. This argument leads to the following hypothesis:

H2a: *Ceteris paribus*, if a firm’s institutional ownership is predominantly composed of institutions that are transient, then its manager is *more* likely to cut R&D to meet short-term earnings goals.

In contrast, Porter (1992, 46–49) argues that “dedicated” owners (which he mainly ascribes to Germany and Japan) alleviate pressures for myopic investment behavior because their large, long-term holdings, which are concentrated in only a few firms, provide incentives to monitor managers and to rely on information other than earnings to assess the managers’ performance. The monitoring role of dedicated institutions leads to the following hypothesis:

⁴ For example, the consulting firm Georgeson Co. analyzes the portfolios of “almost 1,500 domestic and foreign institutions” in order to characterize a client’s investor base and assist managers in “screening out” institutions with high turnover, index, or quantitative strategies in favor of institutions with long investment horizons and holdings in companies with similar characteristics to the client (Elgin 1992).

⁵ This classification method does not proxy for classifications based on type, investment styles, or institutional size. Institutions in the transient, quasi-indexer and dedicated groups all exhibit significant heterogeneity across these other possible classification schemes. Because of this heterogeneity, I find no significant differences in results of the myopic behavior tests across groups of institutions formed by these other methods.

H2b: *Ceteris paribus*, if a firm's institutional ownership is predominantly composed of institutions that are dedicated, then its manager is *less* likely to cut R&D to meet short-term earnings goals.

The third group of institutional investors, "quasi-indexers," use indexing or buy-and-hold strategies that are characterized by high diversification and low portfolio turnover. Porter (1992, 42–46) claims that the presence of quasi-indexers exacerbates incentives for myopic investment behavior because their passive, fragmented ownership leads them to gather little information on the company and provides little incentive to monitor managers. This type of institutional ownership, in effect, abdicates its potential influence over managers to other types of active investors who could pressure managers into focusing on short-run earnings goals. However, Monks and Minow (1995, chap. 2) espouse the opposite viewpoint that institutions that are unable to sell because of their indexing strategies have strong incentives to monitor management to ensure it is acting in the long-term interests of the firm. Because of these contrasting views, I do not make a formal hypothesis about the influence of quasi-indexers, but include them in the analysis for descriptive purposes.

III. METHODOLOGY

Research Design

To test whether managers reduce R&D to meet earnings goals, I assume that managers use last year's earnings per share as their earnings target. The business press uses this benchmark to analyze current earnings performance and prior research provides evidence that managers have incentives to avoid decreases in earnings (Burgstahler and Dichev 1997; Barth et al. 1997).⁶ I divide the sample into three subsamples based on the relationship between pre-tax, pre-R&D earnings changes and prior levels of R&D.⁷ I test for myopic investment behavior in a sample of firms, which I call the "Small Decrease" (SD) sample, whose earnings before R&D and taxes have declined relative to the prior year, but by an amount that can be reversed by a reduction in R&D. This specification assumes that managers have unbiased expectations of pre-tax, pre-R&D earnings early enough in the fiscal year to make decisions to reduce R&D expenditures. Burgstahler and Dichev (1997) find that firms with small earnings decreases are underrepresented in the distribution of observed earnings changes, indicating that firms below but near last year's earnings are managing earnings upward. Baber et al. (1991) report that such firms increase R&D by less, on average, than firms with both increases or large decreases in earnings before investment, which they cite as evidence that managers of firms with small earnings declines use R&D cuts to increase earnings.

For comparison purposes, I also create "Increase" (IN) and "Large Decrease" (LD) samples. The IN sample contains all firms with positive changes in pre-tax, pre-R&D earnings; these firms could maintain last year's R&D and still have an increase in pre-tax earnings. The LD sample consists of firms with declines in pre-tax, pre-R&D earnings greater than the amount of prior year's R&D; these firms could eliminate R&D spending

⁶ I chose not to use analysts' forecasts as the earnings target because this benchmark would (1) bias the sample toward firms with greater levels of institutional ownership (O'Brien and Bhushan 1990), (2) require an estimate of the analysts' expectation of R&D to get expected pre-R&D earnings, and (3) create a specification problem if analysts anticipate earnings management, as suggested by the findings of Burgstahler and Eames (1998).

⁷ I use pre-tax earnings, rather than after-tax earnings, to make the results comparable to prior research (Baber et al. 1991) and to avoid introducing error in the estimation of marginal tax rates to obtain after-tax R&D. As a check, I estimated after-tax R&D using three tax rate assumptions: (1) the statutory rate, (2) the effective tax rate, and (3) the effective tax rate adjusted for the estimated R&D credit. The correlations between sample assignments across these three methods and the before-tax method were all over 0.85.

and still report a decrease in pre-tax earnings. Because managers of IN and LD firms do not have the same incentives to reduce R&D to meet the earnings target, the relation between institutional ownership and R&D cuts in these samples should differ from the relation in the SD sample if the relation is driven by institutional investor pressure for or against myopic investment behavior.

The dependent variable I use to test for myopic investment behavior is an indicator variable (CUTRD) that equals one if the firm cuts R&D relative to the prior year, and zero if the firm maintains or increases R&D. I use an indicator variable rather than the magnitude of the change in R&D because theory does not address how the level of institutional ownership should affect the magnitude of increases in R&D, and because the magnitude of decreases in R&D should be based on the amount of the earnings decline. Thus, the magnitude of the change in R&D is unlikely to be a linear function of the level of institutional ownership.⁸

To test hypotheses 1a and 1b on the influence of institutional ownership on myopic investment behavior, I use a logit model to regress CUTRD on the level of the firm's institutional ownership and a set of control variables (discussed below) that proxy for changes in the R&D investment opportunity set, differences in the costs of cutting R&D, and proxies for other earnings management incentives:

$$\begin{aligned} \text{Prob}(\text{CUTRD}_i = 1) = F(\alpha + \beta_1 \text{PCRD}_i + \beta_2 \text{CIRD}_i + \beta_3 \text{CGDP}_i + \beta_4 \text{TOBQ}_i \\ + \beta_5 \text{CCAPX}_i + \beta_6 \text{CSALES}_i + \beta_7 \text{SIZE}_i + \beta_8 \text{DIST}_i + \beta_9 \text{LEV}_i \\ + \beta_{10} \text{FCF}_i + \beta_{11} \text{PIH}_i) \end{aligned} \quad (1)$$

where $F(\cdot)$ is the logistic c.d.f.

CUTRD = 1 if R&D is cut relative to the prior year, 0 otherwise;

PCRD = prior year's change in R&D;

CIRD = change in industry R&D-to-sales ratio, defined using 4-digit SIC codes;

CGDP = change in gross domestic product;

TOBQ = Tobin's q (the sum of market value of common equity, book value of preferred equity, long-term debt, and short-term debt, divided by total assets);

CCAPX = change in capital expenditures;

CSALES = change in sales;

SIZE = market value of equity;

DIST = distance from earnings goal relative to prior year's R&D, defined as the change in pre-tax, pre-R&D earnings divided by prior year's R&D;

LEV = leverage (debt-to-assets);

FCF = free cash flow (cash flow from operations less capital expenditures, scaled by net tangible assets);

PIH = percentage of institutional holdings.

To test hypotheses 2a and 2b on the effect of different groups of institutions on myopic

⁸ I also considered using an indicator variable for whether the firm successfully reversed the earnings decline with R&D cuts. I chose not to use this variable because I could not apply the model out of the SD sample as a robustness check. I reran the analysis with this indicator variable in the SD sample and the results for the institutional holdings variable were unchanged.

investment behavior, I first restrict the sample to firms with at least five percent institutional ownership to ensure that institutional ownership is likely to be influential in the firm. Then I add indicator variables for the composition of institutional ownership to equation (1). The indicator variable for each group (transient, quasi-indexer, dedicated) equals one when a firm's institutional ownership is dominated by this group, and zero otherwise. This specification more powerfully identifies firms in which a given group is likely to be influential (compared to the percentage ownership by each group) and avoids the problem that percentage ownership by the three groups is highly correlated. This approach yields the following regression:

$$\begin{aligned} \text{Prob}(\text{CUTRD}_i = 1) = & F(\alpha + \beta_1 \text{PCRD}_i + \beta_2 \text{CIRD}_i + \beta_3 \text{CGDP}_i + \beta_4 \text{TOBQ}_i \\ & + \beta_5 \text{CCAPX}_i + \beta_6 \text{CSALES}_i + \beta_7 \text{SIZE}_i + \beta_8 \text{DIST}_i + \beta_9 \text{LEV}_i \\ & + \beta_{10} \text{FCF}_i + \beta_{11} \text{PIH}_i + \beta_{12} \text{DQ5}(\text{Transient})_i \\ & + \beta_{13} \text{DQ5}(\text{Quasi-Indexer})_i + \beta_{14} \text{DQ5}(\text{Dedicated})_i) \end{aligned} \quad (2)$$

where $\text{DQ5}(\text{GROUP}_k)_i = 1$ if firm i is in the top quintile of proportional ownership by group k , and zero otherwise; $\text{GROUP}_k = \text{Transient, Quasi-Indexer, Dedicated}$.

Control Variables

To control for motivations to cut R&D that are unrelated to myopic investment behavior incentives, I include proxies for the R&D investment opportunity set (i.e., the set of available positive NPV projects in which the firm could invest). These proxies are based on the expectations model for the level of R&D intensity developed in Berger (1993). Except for Tobin's q , I take first differences in his variables to obtain a model for the change in R&D. Each of the variables is defined to have a negative expected relation with the decision to cut R&D (see table 1 for variable definitions).⁹

The prior year's change in R&D (PCRD) proxies for changes in the firm's R&D opportunity set over time (Berger 1993). If a firm's R&D opportunity set has been declining (increasing) over time, a decline (increase) in R&D last year makes a firm more (less) likely to cut R&D this year.¹⁰ The change in industry R&D intensity (CIRD) captures changes in the R&D opportunity set within the firm's industry and changes in the level of R&D spending needed to stay competitive within the industry (Berger 1993). Both explanations suggest that firms in industries with increasing (decreasing) R&D are expected to be less (more) likely to cut R&D. Changes in the Gross Domestic Product (CGDP) measure growth in the overall economy and proxy for increases in the level of technological progress in the economy (Berger 1993). In years when CGDP is high (low), firms are expected to have more (fewer) profitable R&D opportunities and thus be less (more) likely to reduce R&D. Berger (1993) includes Tobin's q (TOBQ) to capture the marginal benefit-to-cost ratio of undertaking new investment. As a proxy for the unobservable marginal TOBQ, Berger (1993) uses the average TOBQ, defined as the market value of the firm's equity and debt,

⁹ I drop two variables from his model: a measure of funds available for investment and an R&D tax credit usability variable. I drop the funds available variable because it is pre-R&D earnings plus depreciation, which is similar to what I use to partition the sample. I drop the credit usability variable because it does not explain cuts in R&D and it requires three years of data on deferred tax liability, thereby reducing the sample size. Reed and Plumlee (1998) find that tax motivations only lead to cuts in R&D when the firm's earnings are substantially above the prior year's level.

¹⁰ An alternative explanation is that if the firm reduced R&D in the prior year, it becomes more costly to cut R&D again, indicating a positive relation between PCRD and CUTRD.

TABLE 1
Definitions of Variables

<i>Variable</i>	<i>Definition</i>	<i>Expected Sign^a</i>
Indicator for cut in R&D (CUTRD)	1 if $(RD_t - RD_{t-1}) < 0$, 0 otherwise	
Prior change in R&D (PCRD)	$\ln(RD_{t-1}) - \ln(RD_{t-2})$	—
Change in industry R&D intensity (CIRD)	$\ln(IRD_t / ISALES_t) - \ln(IRD_{t-1} / ISALES_{t-1})$	—
Change in capital expenditures (CCAPX)	$\ln(CAPX_t) - \ln(CAPX_{t-1})$	—
Change in sales (CSALES)	$\ln(SALES_t) - \ln(SALES_{t-1})$	—
Tobin's q (TOBQ)	TOBQ _t	—
Change in gross domestic product (CGDP)	$\ln(GDP_t) - \ln(GDP_{t-1})$	—
Firm size (SIZE)	$\ln(MVE_t)$	—
Distance from earnings goal (DIST)	$(EBTRD_t - EBTRD_{t-1}) / RD_{t-1}$	+
Leverage (LEV)	$(LTD_t + STD_t) / ASSETS_t$	+
Free cash flow (FCF)	$(CFO_t - \text{Average } CAPX_{t-1 \text{ to } t-3}) / CA_{t-1}$	—
Percentage of institutional holdings (PIH)	ISHARES _t / TSHARES _t	— / —
Indicator for predominant ownership by group k (DQ5(GROUP _k)), k = quasi-indexer, transient, dedicated	1 if PIH(GROUP _k) / PIH in top quintile of distribution, 0 otherwise	— / —

RD_t = Research and development per share (46/54)^b

IRD_t = Total research and development for all firms in same 4-digit SIC code, excluding the firm

ISALES_t = Total sales for all firms in same 4-digit SIC code, excluding the firm

CAPX_t = Capital expenditures per share (30/54)

SALES_t = Sales per share (12/54)

TOBQ_t = Tobin's q [(Market value of equity + preferred stock + total debt) / total assets] [(199*25 + 130 + 9 + 34) / 6]

GDP_t = Gross domestic product

MVE_t = Market value of equity (199*25)

EBTRD_t = Earnings per share before taxes and R&D ((170+46)/54)

LTD_t = Long-term debt (34)

STD_t = Short-term debt (9)

ASSETS_t = Total assets (6)

CFO_t = Cash from operations (18 - Δ4 + Δ5 + Δ1 - Δ34 + 14)

CA_t = Current assets (4)

ISHARES_t = Total shares held by institutional investors

TSHARES_t = Total shares outstanding

PIH(GROUP_k) = Percentage institutional ownership by group k, k = Quasi-indexer, transient, dedicated

^a This column lists each variable's expected relation to CUTRD.

^b Compustat numbers are in parentheses.

divided by the book value of its assets. Because of the accounting treatment of R&D, this measure is similar to the market-to-book ratio in that both are positively associated with the future value of R&D spending. Based on these interpretations, firms with higher (lower) TOBQ have more (fewer) valuable R&D opportunities and face a higher (lower) cost of reducing R&D for myopic reasons.¹¹

I include additional variables not found in Berger's (1993) model to control for other R&D opportunity set measures, for the costs of cutting R&D to manage earnings, and for other incentives to manage earnings. The change in capital expenditures (CCAPX) proxies for reduced funds available for investment and/or entry into a more mature, lower investment stage of the firm's life cycle (Perry and Grinaker 1994). Both explanations yield an expected negative relation with CUTRD. The change in sales (CSALES) is not included in Berger's (1993) model because he is estimating the R&D-to-sales ratio. I include CSALES to proxy for firm growth and funds available for R&D investment, as well as to capture the fact that R&D budgets are often based on sales (Berger 1993). For each of these reasons, a negative relation with the decision to cut R&D is expected.

A size variable (SIZE), the log of market value of equity, proxies for two possible effects, both of which lead to a negative expected relation with CUTRD. First, SIZE proxies for the amount of information available about the firm (Wiedman 1996). Larger (smaller) firms have richer (poorer) information environments that should reduce (increase) opportunities for successful earnings management with R&D. Second, SIZE proxies for the likelihood the firm faces cash constraints (Jalilvand and Harris 1984). Smaller firms are more likely to suffer cash flow shortages that force them to reduce R&D.¹²

The distance of the expected earnings from the earnings target (DIST) measures the percentage of R&D that would need to be cut to obtain a positive earnings change. As a firm's expected earnings get farther from (closer to) the earnings goal, the cost of cutting R&D to manage earnings increases (decreases). This variable is defined as the change in pre-tax, pre-R&D earnings divided by prior year's R&D. For firms in the SD sample, this variable ranges between 0 and -1. A firm with a value of DIST equal to -0.8 (-0.2) would need to reduce its R&D by 80 percent (20 percent) relative to the prior year to reverse the decline in earnings. Firms with high (less negative) values of DIST have the ability to meet their earnings target through less severe cuts in R&D (e.g., reductions in the number of prototypes or test runs and/or elimination of basic research projects); whereas firms with lower (more negative) values of DIST need to make more substantial cuts in

¹¹ I use the level of Tobin's *q* rather than the change in Tobin's *q* because the latter measure is highly correlated with changes in the market value of equity. Since such changes can be driven by factors other than changes in the R&D opportunity set (such as market reactions to the decision to cut R&D), the construct validity of the levels measure is likely to be higher. If I replace TOBQ with the change in Tobin's *q*, the coefficient on the latter is positive and significant, which is opposite of what is expected and likely reflects the construct validity problem. I also replaced TOBQ with the market-to-book ratio and found similar results. Neither of the changes affects the sign or significance of the institutional holdings variables.

¹² SIZE could also proxy for two effects that lead to a positive relation with CUTRD. First, smaller firms generally have larger managerial holdings, which reduces incentives to manage earnings based on capital market pressures (Warfield et al. 1995). Second, smaller firms tend to have higher (lower) percentages of new product research (basic research) in their R&D budgets (Mansfield 1981). To the extent that it is more (less) costly to cut R&D for new products (basic research), smaller firms have less flexibility to cut R&D to manage earnings (Schneiderman 1991). In both these cases, SIZE is a fairly weak proxy for the underlying effect, making a positive relation between SIZE and CUTRD less likely.

R&D (e.g., personnel and equipment) to meet their earnings goals. Thus, a positive relation between DIST and CUTRD is expected.¹³

The firm's leverage ratio (LEV) captures potential debt covenant incentives to manage earnings (Duke and Hunt 1990). A positive sign is expected if meeting debt covenants motivates earnings management. Higher LEV could also indicate fewer growth opportunities for the firm (Myers 1984), in which case a positive sign would also be expected. Finally, I include a measure of free cash flow (FCF), defined as cash flow from operations less capital expenditures, scaled by net tangible assets, to proxy for possible near-term financing requirements. Firms with substantially negative free cash flows have a greater need to raise equity in the near-term, and thus have incentives to boost earnings and reduce the chance of an undervaluation (Dechow et al. 1996). This variable also proxies for reduced funds available for investment, which might trigger reductions in R&D. Either explanation indicates that a negative relation with CUTRD is expected.¹⁴

Institutional Ownership Variables

I measure the percentage of institutional holdings (PIH) as total shares held by institutions divided by total shares outstanding. PIH is calculated at the end of the calendar quarter in which the firm's third fiscal quarter ends. This date is chosen to measure institutional ownership in the middle of the second half of the fiscal year, when I assume the manager likely has an accurate expectation of annual earnings and begins to consider myopic investment behavior decisions.¹⁵

To obtain variables on the percentage of ownership by different groups of institutions, I first use factor analysis and cluster analysis to assign institutions into groups based on their past investment behavior (see section VI for details of this procedure). Then, I calculate the proportion of ownership held by each group of institutions for each firm (e.g., $PIH(GROUP_k)/PIH_i$), where the groups are transient, dedicated, and quasi-indexer. I rank firms into quintiles based on the distribution of this proportion for each group and create an indicator variable ($DQ5(GROUP_k)_i$) that equals one if the firm is in the top quintile of proportional ownership by group k , and zero otherwise.¹⁶

¹³ The DIST variable captures other incentives outside of the SD sample. In the IN sample, DIST is always positive, and large values indicate a large positive change in pre-R&D earnings relative to prior R&D. If managers have incentives to increase R&D to dampen earnings growth, a positive sign should result. In the LD sample, DIST is always less than -1, and small values indicate a large negative change in pre-R&D earnings relative to prior R&D. If managers have incentives to increase R&D to take a "big bath" in earnings during the year, a negative relation should result.

¹⁴ I chose not to include a proxy for bonus motivations because Holthausen et al. (1995) provide evidence that R&D is not managed for bonus reasons and because hand collection of a bonus plan proxy would significantly reduce the sample size.

¹⁵ To obtain some descriptive evidence on this assumption, I examined quarterly R&D disclosures on Compustat. Compustat reports quarterly R&D for years after 1989, but quarterly R&D disclosures are voluntary and are only reported by approximately 40 percent of the sample firms. For firms in the SD sample, the mean seasonal percentage changes in R&D by quarter are 10.8 percent for the first quarter, 8.7 percent for the second, 7.3 percent for the third, and 4.8 percent for the fourth. For firms in the IN (LD) sample, the comparable changes are 12.1 percent, 12.8 percent, 14.6 percent and 14.8 percent (12.6 percent, 10.7 percent, 5.6 percent, and 7.0 percent), respectively. This evidence indicates that some SD sample firms are able to reduce R&D late in the fiscal year.

¹⁶ I use quintiles because they yield extreme proportional differences while still maintaining a reasonable number of observations in the top quintile. I performed the ranking, and the subsequent analyses, using terciles and quartiles. The results are similar, though less significant, using the less extreme fractiles. I also formed the quintiles after ranking on SIZE and PIH to control for any association between extreme ownership by groups and those variables. The results were insensitive to this approach.

IV. SAMPLE AND DESCRIPTIVE STATISTICS

The sample includes all firm-years between 1983 and 1994 with available data. The sample period is restricted by the availability of institutional holdings data and the requirement of two years of data from which to calculate portfolio characteristics of institutions. I collect institutional holdings data from the University of Michigan Spectrum database, which contains all 13-f filings between September 30, 1981 and December 31, 1994. According to SEC Rule 13-f, all institutions managing more than \$100 million in equity must file a quarterly report listing all equity holdings that are greater than 10,000 shares or \$200,000 in market value. Thus, for each firm, total institutional holdings is defined as the sum of all end-of-calendar-quarter holdings by fund managers filing 13-fs on the firm. I gather total shares outstanding from the 1995 CRSP Daily NYSE, AMEX and NASDAQ files, and GDP data from the 1995 Economic Report of the President. All other variables are obtained from the 1995 Compustat PST, Full Coverage and Research files.

Panel A of table 2 shows the criteria used to select the sample. I exclude firm-year observations for which: (1) current or prior year R&D data is missing, (2) the ratio of R&D-to-sales is less than 1 percent (i.e., R&D is not a significant portion of earnings),

TABLE 2
Sample Sizes

Panel A: Sample Selection Criteria

<i>Criteria</i>	<i>Firm-Years</i>
Compustat firm-years with nonmissing R&D, 1983–1994	30,324
Less: Missing prior year R&D data	(3,754)
R&D/sales less than 1%	(6,135)
Fewer than three other firms in industry	(131)
Missing data to calculate independent variables	(4,165)
Missing Spectrum institutional holdings data	(2,195)
Final sample	13,944

Panel B: Number of Observations and Frequency of R&D Cuts in Small Decrease (SD), Increase (IN) and Large Decrease (LD) Samples^a

	<i>Samples</i>			<i>Total</i>
	<i>SD Sample</i>	<i>IN Sample</i>	<i>LD Sample</i>	
Cut R&D ^b	852 (34.5%)	2,190 (25.7%)	1,041 (35.2%)	4083
Increase R&D	1,617 (65.5%)	6,330 (74.3%)	1,914 (64.8%)	9861
Total	2,469	8,520	2,955	13,944

^a The SD sample consists of all firm-years for which $-RD_{t-1} < (EBTRD_t - EBTRD_{t-1}) < 0$. The IN sample consists of all firm-years for which $(EBTRD_t - EBTRD_{t-1}) > 0$. The LD sample consists of all firm-years for which $(EBTRD_t - EBTRD_{t-1}) < -RD_{t-1}$. $EBTRD_t$ is earnings before taxes and R&D.

^b The Cut (Increase) sample consists of all firm-years for which the change in R&D per share is negative (nonnegative).

(3) fewer than three other firms are available in the same industry (4-digit SIC) to calculate industry R&D intensity, (4) data needed to calculate independent variables are missing or equal to zero (which prevents the calculation of log differences in year-to-year amounts), and (5) institutional ownership data is not available on Spectrum. The final sample consists of 13,994 firm-years.

Panel B of table 2 summarizes the number of observations in the SD, LD and IN samples, and the number of firm-years for which R&D was cut in each case.¹⁷ The table shows a significant percentage of firm-year observations with R&D cuts in each sample, and that the number of firm-year observations with R&D cuts in the SD and LD samples are roughly equivalent. It also shows that a majority of firm-year observations in the SD sample do not cut R&D and, hence, do not boost earnings through R&D cuts.¹⁸ These findings indicate that managerial myopia incentives do not completely explain differences in R&D investment behavior across the samples. This observation motivates the inclusion of the controls for opportunity set differences, other earnings management proxies, and institutional ownership variables to explain cross-sectional differences in the decision to cut R&D.

Panel A of table 3 presents means and standard deviations for the variables used in the empirical tests for the SD, IN and LD samples. The percentage change in R&D (CRD) is significantly less positive in the SD sample than in either of the other two samples, consistent with the results of Baber et al. (1991). For most of the other variables, the means in the SD sample lie between the means in the other two samples, as might be expected given the differences in earnings performance across samples.

Panel B of table 3 compares the means of these variables for firm-year observations with R&D cuts and R&D increases in the SD sample. These comparisons provide univariate evidence on myopic investment behavior. The significant differences for PCRD, CIRD, TOBQ, CCAPX and CSALES indicate that reduced opportunity sets significantly explain reductions in R&D. Firms that cut R&D in the SD sample are smaller and more highly leveraged, as expected based on the arguments in the prior section. The percentage of institutional holdings is significantly lower for firms in the SD sample that cut R&D, indicating that higher levels of institutional ownership make managers less likely to use R&D cuts to manage earnings. However, the correlation between PIH and SIZE is high ($r = 0.57$); thus, the relation between institutional holdings and the decision to cut R&D must be examined conditional on SIZE.¹⁹

¹⁷ I examined the sample by industry and by year to check for any significant clustering of observations. The majority of the sample firms are in manufacturing, pharmaceuticals/chemicals, and software development industries. The proportion of firms in each industry that cut R&D when in the SD sample does not deviate greatly from the proportion of total observations in the industry. The percentage of firms cutting R&D by year ranges from 23 percent (in 1984) to 41 percent (in 1986 and 1987). Other than these three years, there does not appear to be significant time clustering in R&D reductions.

¹⁸ Because the sample design ignores other methods of managing earnings (e.g., accrual manipulation), these findings likely understate the amount of earnings management that occurs in firms with small declines in earnings. Some firms with expected declines in earnings might have managed earnings using other, less costly means to get into the IN sample. Thus, the SD sample is potentially biased toward firms that lack the discretion in their reporting or economic decisions to boost earnings, thereby reducing the power of the tests.

¹⁹ Other than this correlation, the only pairwise correlations larger than 0.20 between independent variables are the correlations between TOBQ and FCF ($r = -.34$), CSALES and CCAPX ($r = 0.27$), and TOBQ and PCRD ($r = 0.24$). Thus, the independent variables appear to be proxying for different effects. To assess the potential impact of more complex forms of multicollinearity, I examined variance inflation factors (VIF) for each variable. VIFs are based on the R^2 from regressing each independent variable on all other independent variables. A VIF of 1 indicates no multicollinearity and a VIF in excess of 10 indicates harmful multicollinearity (Kennedy 1992, 183). All of the VIFs were less than 1.7, indicating that multicollinearity is not a problem in this sample.

V. RESULTS FOR INSTITUTIONAL OWNERSHIP AS A WHOLE

Main Results

Table 4 presents results for the logit regression of the indicator for cuts in R&D (CUTRD) on the control variables and the percentage of institutional ownership (PIH) (see equation (1)). The first column presents coefficients and p-values for the SD sample. Consistent with the univariate tests, most of the opportunity set variables (PCRD, CIRD,

TABLE 3
Descriptive Statistics

Panel A: Descriptive Statistics for Small Decrease (SD), Increase (IN), and Large Decrease (LD) Samples^a

<i>Variable</i>		<i>Sample</i>			<i>Differences in Means</i>	
		<i>SD</i>	<i>IN</i>	<i>LD</i>	<i>(SD)-(IN)</i>	<i>(SD)-(LD)</i>
CUTRD ^b	Mean	0.345	0.257	0.352	0.088**	-0.007
	Std. dev.	0.475	0.437	0.478		
CRD	Mean	0.049	0.146	0.121	-0.097**	-0.072**
	Std. dev.	0.330	0.383	0.469		
PCRD	Mean	0.167	0.150	0.157	0.017*	0.010
	Std. dev.	0.349	0.418	0.506		
CIRD	Mean	0.110	0.110	0.091	0.000	0.019*
	Std. dev.	0.257	0.250	0.283		
CGDP	Mean	0.027	0.030	0.027	-0.003**	0.000
	Std. dev.	0.017	0.017	0.018		
TOBQ	Mean	1.536	1.856	1.378	-0.320**	0.158**
	Std. dev.	1.741	1.896	1.593		
CCAPX	Mean	-0.019	0.106	-0.108	-0.125**	0.089**
	Std. dev.	0.784	0.824	0.895		
CSALES	Mean	0.027	0.181	-0.068	-0.154**	0.095**
	Std. dev.	0.243	0.271	0.315		
SIZE	Mean	4.300	4.725	3.724	-0.425**	0.576**
	Std. dev.	2.173	2.190	2.041		
DIST	Mean	-0.417	2.279	-4.949	-2.696**	4.532**
	Std. dev.	0.283	9.335	12.921		
LEV	Mean	0.184	0.180	0.251	0.004	-0.067**
	Std. dev.	0.178	0.172	0.227		
FCF	Mean	-0.156	-0.054	-0.257	-0.102**	0.101**
	Std. dev.	0.417	0.453	0.525		
PIH	Mean	0.233	0.264	0.190	-0.031**	0.043**
	Std. dev.	0.208	0.228	0.192		
N		2469	8520	2955		

(Continued on next page)

TABLE 3 (Continued)

Panel B: Descriptive Statistics for SD Sample by Cut or Increase in R&D

Variable		Sample ^c		Differences in Means	Expected Sign ^d
		Cut	Increase	(Cut)-(Increase)	
CRD	Mean	-0.248	0.206	-0.454**	
	Std. dev.	0.314	0.208		
PCRD	Mean	0.124	0.190	-0.066**	-
	Std. dev.	0.367	0.337		
CIRD	Mean	0.079	0.127	-0.048**	-
	Std. dev.	0.256	0.256		
CGDP	Mean	0.026	0.027	-0.001	-
	Std. dev.	0.016	0.017		
TOBQ	Mean	1.420	1.598	-0.178**	-
	Std. dev.	1.759	1.729		
CCAPX	Mean	-0.225	0.089	-0.314**	-
	Std. dev.	0.794	0.756		
CSALES	Mean	-0.035	0.060	-0.095**	-
	Std. dev.	0.249	0.233		
SIZE	Mean	3.938	4.491	-0.557**	-
	Std. dev.	2.242	2.111		
DIST	Mean	-0.424	-0.414	-0.010	+
	Std. dev.	0.281	0.284		
LEV	Mean	0.202	0.174	0.028**	+
	Std. dev.	0.205	0.161		
FCF	Mean	-0.156	-0.156	0.000	-
	Std. dev.	0.414	0.418		
PIH	Mean	0.201	0.250	-0.049**	+/-
	Std. dev.	0.198	0.212		
N		852	1617		

* Significantly different from zero (two-tailed) at or below the 0.05 level.

** Significantly different from zero (two-tailed) at or below the 0.01 level.

^a The SD sample consists of all firm-years for which $-RD_{t-1} < (EBTRD_t - EBTRD_{t-1}) < 0$. The IN sample consists of all firm-years for which $(EBTRD_t - EBTRD_{t-1}) > 0$. The LD sample consists of all firm-years for which $(EBTRD_t - EBTRD_{t-1}) < -RD_{t-1}$. $EBTRD_t$ is earnings before taxes and R&D.^b CRD is the log change in R&D per share. All other variables are defined in table 1.^c The Cut (Increase) sample consists of all firm-years for which the change in R&D per share is negative (nonnegative).^d This column lists each variable's expected relation to CUTRD.

CCAPX, CSALES) are significantly associated with the probability of cutting R&D in the direction anticipated. The coefficient on SIZE indicates that smaller firms are significantly more likely to cut R&D, consistent with the explanations that small firms are more cash

TABLE 4
Logit Regression of Indicator for Cut in R&D (CUTRD) on Control Variables and
Institutional Holdings

$$\begin{aligned} \text{Prob}(\text{CUTRD}_i = 1) = & F(\alpha + \beta_1 \text{PCRD}_i + \beta_2 \text{CIRD}_i + \beta_3 \text{CGDP}_i + \beta_4 \text{TOBQ}_i \\ & + \beta_5 \text{CCAPX}_i + \beta_6 \text{CSALES}_i + \beta_7 \text{SIZE}_i + \beta_8 \text{DIST}_i + \beta_9 \text{LEV}_i \\ & + \beta_{10} \text{FCF}_i + \beta_{11} \text{PIH}_i) \end{aligned}$$

Variable	Expected Sign	SD Sample ^a		IN Sample		LD Sample	
		Coefficient (p-value)	Marginal Effects ^c	Coefficient (p-value)	Marginal Effects	Coefficient (p-value)	Marginal Effects
Intercept ^b		-0.158 (0.323)		0.372 (0.000)		0.071 (0.596)	
PCRD	-	-0.448 (0.001)	-0.029	-0.335 (0.000)	-0.018	-0.249 (0.005)	-0.020
CIRD	-	-0.677 (0.000)	-0.027	-0.706 (0.000)	-0.020	-0.600 (0.000)	-0.024
CGDP	-	0.399 (0.882)	0.001	-3.398 (0.036)	-0.005	-6.138 (0.008)	-0.020
TOBQ	-	-0.020 (0.497)	-0.004	0.018 (0.300)	0.004	-0.066 (0.044)	-0.001
CCAPX	-	-0.443 (0.000)	-0.075	-0.404 (0.000)	-0.054	-0.219 (0.000)	-0.044
CSALES	-	-1.464 (0.000)	-0.056	-2.161 (0.000)	-0.082	-1.526 (0.000)	-0.087
SIZE	-	-0.054 (0.031)	-0.030	-0.226 (0.000)	-0.117	-0.055 (0.033)	-0.031
DIST	+ ^d	0.072 (0.649)	0.007	-0.036 (0.000)	-0.012	0.061 (0.000)	0.043
LEV	+	0.782 (0.002)	0.041	0.769 (0.000)	0.030	0.613 (0.002)	0.038
FCF	-	0.064 (0.595)	0.004	-0.349 (0.000)	-0.015	-0.076 (0.479)	-0.005
PIH	+/-	-0.928 (0.001)	-0.069	-0.030 (0.859)	-0.002	-0.412 (0.144)	-0.026
pseudo-R ²		0.122		0.220		0.121	
N		2469		8520		2955	

^a The SD sample consists of all firm-years for which $-\text{RD}_{i-1} < (\text{EBTRD}_i - \text{EBTRD}_{i-1}) < 0$. The IN sample consists of all firm-years for which $(\text{EBTRD}_i - \text{EBTRD}_{i-1}) > 0$. The LD sample consists of all firm-years for which $(\text{EBTRD}_i - \text{EBTRD}_{i-1}) < -\text{RD}_{i-1}$. EBRD_i is earnings before taxes and R&D.

^b All variables are defined in table 1.

^c The marginal effect represents the change in the probability that the firm cuts in R&D given a change in the independent variable over the interquartile range (i.e., from the 25th percentile to the 75th percentile).

^d The expected sign for DIST only applies to the SD sample. If earnings smoothing (big bath) incentives motivate managers of firms in the IN (LD) sample, a positive (negative) sign is expected in the IN (LD) sample.

constrained and/or have greater information asymmetries which allow them to use R&D to manage earnings. The coefficient on LEV is significantly positive, consistent with earnings management based on debt covenant incentives and/or reduced growth opportunities. Neither free cash flow (FCF) nor the distance from the earnings goal (DIST) variable is significant.

Turning to the main result, the coefficient on the PIH variable is significantly negative. This result supports H1b, suggesting that institutional investors are sophisticated investors who serve a monitoring role, relative to individual investors, in reducing the incentives of managers to reverse a decline in earnings through cuts in R&D. This finding does not support the concern, expressed in H1a, that institutional investors cause underinvestment in R&D based on their expected reactions to disappointing current earnings news.

The second column of table 4 presents the estimated impact of a change in each independent variable across its interquartile range on the probability of cutting R&D. To obtain this impact, I multiply the marginal effect of a one-unit change in the independent variable (which is calculated as the estimated coefficient times the logit density function evaluated at the sample means of the independent variables) by the interquartile range for each variable. A change in institutional holdings across the interquartile range (from 5 percent to 38 percent) reduces the probability that a manager cuts R&D by 6.9 percent. This effect appears economically significant, given that about 30 percent of all firms cut R&D in any given year. Only the CCAPX variable has a larger estimated impact in this sample than the PIH variable.

A possible explanation for the negative relation between institutional ownership and the decision to cut R&D is that institutions prefer to invest in more innovative firms that are unlikely to cut R&D in any circumstance. If this were the case, the negative relation should persist outside of the SD sample. Columns 3–6 of table 4 present results for the logit model in the IN and LD samples. The percentage of institutional holdings has no significant influence on the decision to cut R&D out of the SD sample. These results suggest that institutional ownership exerts a greater influence on R&D investment decisions when managers face a trade-off between maintaining R&D and increasing earnings.

Columns 3–6 of table 4 also indicate that the coefficients on the opportunity set controls retain their sign and significance in the IN and LD samples, indicating that these variables explain R&D changes equally well across firm-years with different earnings performance. The coefficients on the SIZE and LEV variables also maintain their significance regardless of the realization of current year earnings. Thus, these variables are likely capturing opportunity set determinants of R&D spending rather than proxying for earnings management motivations. Finally, the coefficient on the DIST variable is significant in the IN and LD samples. In the IN sample, the negative coefficient on DIST indicates that firm-years with the largest (smallest) positive changes in earnings relative to prior R&D expense are less (more) likely to cut R&D, which is consistent with the best performers dampening their earnings growth through increased R&D spending. In the LD sample, the positive coefficient on DIST suggests that extremely poor performers are less likely to cut R&D. This indicates that these firms either take a “big bath” with increased R&D spending because they are far below their earnings target or that these are firms in an early high-investment-low-earnings stage of their life cycle.

Robustness Tests

Another possible explanation for the negative relation between institutional ownership and the decision to cut R&D in the SD sample is that, based on past appearances by firms in this sample, institutional investors invest in firms that are less likely to cut R&D when faced with a small decline in earnings. To test this possibility, I examine whether firms that

made repeat occurrences in the SD sample drive the results in table 4. About 50 percent of the firm-year observations in the SD sample are also in the sample in another year, and an additional 25 percent are in the SD sample an additional two years. I partition the sample into firms that made multiple appearances in the SD sample and those that made only a single appearance, and run the regression in equation (1) in each partition. The coefficient on PIH is negative and significant at the 0.05 level in both partitions (not reported). Thus, the results in table 4 are not driven by firms that repeatedly fall in the SD sample.

Because institutional ownership is positively associated with the level of analyst following (O'Brien and Bhushan 1990), another possible explanation for the results in table 4 is that managers are less likely to cut R&D given a large analyst following. Analyst following proxies for a richer information environment for the firm and less uncertainty about the quality of investment spending. As an additional control variable, I added the number of analysts following the firm, defined as the number of analysts issuing a forecast of annual earnings on the I/B/E/S database at the time that institutional holdings are collected.²⁰ The coefficient on this variable was insignificant, and the sign and significance of the PIH coefficient was unaffected by the inclusion of this variable.

I tested whether the results are sensitive to the definition of the SD sample, specifically the assumptions that prior year's earnings is the target and that prior year's R&D is the maximum amount of R&D that could be cut to meet the target. I modified the tests to (1) specify the lower bound of the SD sample to be pre-R&D earnings changes equal to one-half, one-third, one-fourth, one-fifth, and one-tenth of prior year's R&D, (2) define the earnings target using a random walk with drift model, and (3) use the Hunt et al. (1996) time trend algorithm for determining the earnings target. In each case, the coefficient of the PIH variable is significant at the 0.01 level in the SD sample and insignificant in the other samples.²¹

I added additional variables to control for potential differences in the costs of cutting R&D across firms. Some R&D projects, such as basic research, are easier for managers to justify dropping because of the lack of immediate benefits and highly uncertain future payoffs (Schneiderman 1991). Since no public data are available regarding the composition of R&D expenditures of individual firms, I use proxies for differences in the average composition of R&D across industries based on survey results from Mansfield (1981). I include indicator variables for firms in industries in which R&D has a higher component of (1) basic research, (2) long-term projects, (3) new projects, and (4) risky projects. As an alternative approach, I add an indicator variable for firms in "high-tech" industries, as defined by Chan et al. (1990). They find that the market reacts positively to R&D increases for high-tech firms, but not for "low-tech" firms, indicating that firms in low-tech industries generally have less valuable R&D and would be more likely to cut R&D to meet earnings goals. None of the additional control variables are significant, likely because they are poor proxies for the costs of cutting R&D for an individual firm. The inclusion of these proxies does not affect the significance of the PIH variable.

I also added additional variables to control for other differences in ability or incentives to maintain earnings growth. I reran the tests adding an indicator variable for firms with at least five years of increasing earnings. Barth et al. (1997) find that such firms have strong

²⁰ I would like to thank I/B/E/S International Inc. for providing this data.

²¹ I also tested the results with the SD sample based on quarterly earnings performance and quarterly R&D expenses for a subsample of firms voluntarily reporting quarterly R&D on Compustat. In this specification, the coefficient on the PIH variable in the SD sample was negative, but not significant. The lack of significant results likely stems from lower power due to a smaller sample (the sample for these tests have less than 400 observations) and to the fact that firms voluntarily reporting quarterly R&D have significantly higher levels of institutional ownership than firms not reporting quarterly R&D, reducing the dispersion in the PIH variable.

incentives to maintain their earnings growth to avoid a significant drop in their pricing multiple. I also included future values of the change in R&D, change in CAPX, change in sales, and change in pre-R&D earnings to proxy for ability/incentives to smooth earnings. The only variable with a significant coefficient in the SD sample was the next year's change in R&D. This variable had a negative coefficient, indicating that firms which cut R&D in the test year had smaller changes in R&D the next year. The inclusion of these variables also did not affect the significance of the PIH variable.

Finally, I tested whether the decision to cut R&D is a function of the change (or expected change) in institutional holdings. I reran the analysis adding the contemporaneous and future changes in institutional holdings as independent variables. I examined future changes up to five years subsequent to the test year. The coefficients on these variables were insignificant in the SD sample, indicating that managers' decisions to cut or increase R&D in this sample do not change the opinions of institutions to the extent that they significantly increase or decrease their holdings.

VI. RESULTS FOR OWNERSHIP BY DIFFERENT GROUPS OF INSTITUTIONS

Classification of Institutional Investors

This section describes how I use factor analysis and cluster analysis to classify institutional investors into groups based on their past investment behavior. Using prior research and guides on institutional ownership, I constructed nine variables that describe the past investment behavior of institutional investors (Baysinger et al. 1991; Porter 1992; Carson Group 1995). I use four variables to proxy for the level of portfolio diversification of each institution (see table 5 for definitions). The level of portfolio concentration (CONC) measures the average percentage of an institution's total equity holdings invested in each portfolio firm. The average percentage holding variable (APH) measures the average size of the institution's ownership position in its portfolio firms. Two variables capture how much of the institution's total equity is invested in firms for which the institution has an influential ownership position. LBPH is the percentage of the institution's equity that is invested in firms where it has greater than 5 percent ownership and HERF is a Herfindahl measure of concentration calculated using the squared percentage ownership in each portfolio firm.

I include two variables to measure the degree of portfolio turnover of the institution. Portfolio turnover (PT) measures the average absolute change in the institution's ownership positions over a quarter, scaled by the change in total equity of the institution. The relative stability of the institution's holdings in its portfolio firms (STAB) measures the percentage of the institution's total equity invested in firms that it has continuously held for the prior two years.

Finally, I include three variables to measure the institution's trading sensitivity to current earnings. The first variable, CETS1, measures the interaction between changes in an institution's holdings in a firm over a quarter and that firm's seasonal change in quarterly earnings announced during the quarter. The value of CETS1 will be high (low) if the institution invests more heavily in firms with larger positive (negative) earnings changes and divests more heavily of firms with negative (positive) earnings. Since this measure assumes a linear relation between the magnitude of the change in holdings and the earnings change, I use two additional measures that allow for nonlinear relations. The second variable, CETS2, measures the difference between the average earnings change of firms in which the institution increased its holdings and the average earnings change of firms in

TABLE 5
Institutional Investor Characteristics*

<i>Variable</i>	<i>Definition</i>
Portfolio concentration (CONC)	$\sum w_{kt} / \text{NSTK}_t$
Average percentage holding (APH)	$(\sum w_{kt} \text{PH}_{kt}) / \sum w_{kt}$
Percent held in large blocks (LBPH)	$(\sum w_{kt} \text{LB}_{kt}) / \sum w_{kt}$
Herfindahl measure of concentration (HERF)	$\ln (\sum \text{PH}_{kt}^2)$
Stability of holdings (percent held for two years) (STAB)	$(\sum w_{kt} \text{LT}_{kt}) / \sum w_{kt}$
Portfolio turnover (PT)	$\sum \Delta w_{kt} / (\sum w_{kt} + \sum w_{k,t-1})$
Trading sensitivity to current earnings (CETS1)	$(\sum \Delta w_{kt} \text{RWE}_{kt}) / \sum \Delta w_{kt} $
Average earnings change of firms bought vs. firms sold (CETS2)	$\text{Avg.} (\text{RWE}_{kt} \Delta w_{kt} > 0) - \text{Avg.} (\text{RWE}_{kt} \Delta w_{kt} < 0)$
Change in holdings in firms with positive earnings vs. firms with negative earnings (CETS3)	$[(\sum \Delta w_{kt} \text{RWE}_{kt} > 0) - (\sum \Delta w_{kt} \text{RWE}_{kt} < 0)] / \sum \Delta w_{kt} $

NSTK_t = number of stocks owned by institution at end of quarter t;

w_{kt} = portfolio weight (shares held times stock price) in firm k at end of quarter t;

Δw_{kt} = w_{kt} - w_{kt-1};

PH_{kt} = percentage of total shares in firm k held by institution at end of quarter t;

LB_{kt} = 1 if PH_{kt} > 0.05, 0 otherwise;

LT_{kt} = 1 if institution held firm k continuously for prior eight quarters, 0 otherwise;

RWE_{kt} = seasonal random walk change in quarterly earnings per share of firm k for quarter t (deflated by sales for quarter t-4);

* The characteristics are calculated at the end of each calendar quarter for every institution on the Spectrum database. The quarterly values are averaged over all quarters available for the calendar year to get end-of-year average values of each characteristic for each institution. These average annual values are used in the subsequent factor and cluster analyses.

which the institution reduced its holdings. The third variable, CETS3, measures the difference between the total change in holdings of firms with positive earnings changes and the total change in holdings of firms with negative earnings changes.

Many of these portfolio characteristics are highly correlated with each other, making it difficult to draw conclusions based on a single characteristic or to include multiple characteristics in the same analysis. To mitigate this problem, I perform principal factor analysis with an oblique rotation to identify and interpret common factors.²² This procedure reduces

²² The principal factor approach is appropriate when the goal of the analysis is exploratory rather than confirmatory, and is adopted in a similar context by Dechow et al. (1996). I chose an oblique rotation over an orthogonal (varimax) rotation because it does not rely on the assumption that the factors are independent. However, a varimax rotation yields virtually identical results.

the dimensionality of the data by combining the nine individual characteristics into a parsimonious set of linear combinations that explain the shared variance among the characteristics. Once common factors are identified, I calculate standardized factor scores for use in the subsequent cluster analysis.

Panel A of table 6 presents the results of the factor analysis, which produced three common factors.²³ The BLOCK factor captures the average size of an institution's stake in its portfolio firms. Institutions with high (low) BLOCK scores have portfolios characterized by larger (smaller) average investments in their portfolio firms. The PTURN factor measures the degree of portfolio turnover. Institutions with high (low) PTURN scores trade more (less) frequently and are less (more) likely to hold any given firm in their portfolio continuously for two years. The MOMEN factor captures the trading sensitivity to current earnings news. Institutions with high MOMEN scores are momentum traders who tend to increase (decrease) their holdings in stocks with positive (negative) current earnings news; whereas institutions with low MOMEN scores are contrarian traders who tend to increase (decrease) their holdings in stocks with negative (positive) current earnings news.

I perform k-means cluster analysis on the factor scores to obtain the final separation of institutions into groups. Cluster analysis is a technique for grouping observations into clusters so that institutions are more similar to institutions in the same cluster than they are to institutions in other clusters.²⁴ There are no standard objective criteria for choosing the number of clusters. Hair et al. (1995) suggest computing a number of different cluster solutions, within a reasonable prespecified range, and deciding among the alternatives based on *a priori* criteria, theoretical considerations, or practical judgment. My goal was to find cluster solutions without disproportionate numbers of observations in some clusters (e.g., one cluster with 90 percent of the observations and the rest with the remaining 10 percent) that closely match the theoretical reasons for splitting institutions into groups.

Panel B of table 6 shows the results of the cluster analysis. The three-cluster solution yields groups matching the definitions of transient, dedicated, and quasi-indexer institutions. Based on the mean factor scores for each cluster, "transient" institutions have the highest turnover (PTURN) and highest use of momentum strategies (MOMEN), along with relatively high diversification (small BLOCK). "Dedicated" institutions have high concentration, low turnover, and almost no trading sensitivity to current earnings (average MOMEN near zero). "Quasi-indexers" exhibit high diversification and low turnover, consistent with index-type, buy-and-hold behavior. Quasi-indexers also exhibit contrarian-trading tendencies (low MOMEN), which are consistent with most buy-and-hold value strategies.

The quasi-indexers are the largest class of institutional investors, accounting for 70 percent of the sample. Since only about 10 percent of institutions have stated index strategies (Carson Group 1995), the majority of the quasi-indexer group does not explicitly index, but follow longer-term buy-and-hold strategies. The predominance of this group is likely due to (1) the fact that the transient group captures only the most aggressive momentum traders, which comprise a relatively small portion of institutional strategies (Carson Group 1995); and (2) the aggregation of all individual funds within a fund group (e.g., all

²³ I used three criteria to determine the appropriate number of factors to keep: scree plots, minimum eigenvalue, and proportion of variance explained. All three criteria produced consistent results.

²⁴ The k-means method of cluster analysis starts with a set of cluster seeds and then assigns observations into clusters based on the Euclidean distances between the observation and the means of the cluster seeds (which change as additional observations are added). With large numbers of observations, the formation of clusters using this method is insensitive to the selection of initial seeds and to the order of the observations (Hair et al. 1995).

TABLE 6
Factor Analysis and Cluster Analysis of Institutional Investor Portfolio Characteristics

Panel A: Factor Analysis^a

<u>Variable</u>	<u>Factors</u>		
	<u>BLOCK</u>	<u>PTURN</u>	<u>MOMEN</u>
APH ^b	0.818	0.019	-0.013
LBPH	0.798	-0.023	-0.004
HERF	0.338	0.063	0.073
CONC	0.327	-0.062	-0.009
PT	0.033	0.766	-0.003
STAB	0.036	-0.751	0.015
CETS1	0.022	0.004	0.727
CETS2	0.004	-0.009	0.722
CETS3	0.009	-0.015	0.053
Variance Explained	43.2%	30.7%	26.1%

Panel B: Clusters Based on Factor Scores^c

<u>Cluster</u>	<u>N^e</u>	<u>Mean Factor Scores^d</u>		
		<u>BLOCK</u>	<u>PTURN</u>	<u>MOMEN</u>
Quasi-Indexers	6060	-0.153	-0.250	-0.272
Transient	2225	-0.075	0.337	0.688
Dedicated	319	3.303	-0.625	-0.078

Panel C: Persistence of Cluster Membership Across Time

<u>Year t Cluster</u>	<u>Percent in Cluster—Year t+1</u>			<u>Percent in Cluster—Year t+3</u>		
	<u>Quasi-Indexers^f</u>	<u>Transient</u>	<u>Dedicated</u>	<u>Quasi-Indexers</u>	<u>Transient</u>	<u>Dedicated</u>
Quasi-Indexers	80.2	19.2	0.6	78.5	20.5	1.0
Transient	56.7	42.5	0.8	57.5	41.2	1.3
Dedicated	10.2	4.1	85.8	18.9	4.9	76.2

^a Factors are estimated using principal factor analysis with an oblique promax rotation.

^b All variables are defined in table 5.

^c Clusters are formed using k-means cluster analysis.

^d The factor scores are generated from the factors in panel A.

^e N represents the number of institution-years in each cluster.

^f The percentages in each column represent the percentage of institutions in each year t cluster that are in each year t+1 (or t+3) cluster, excluding institutions dropping out of the sample prior to year t+1 (t+3).

of Fidelity's funds are listed in one holdings figure).²⁵ The low number of dedicated institutions (4 percent) is not surprising given that institutions often face internal restrictions that limit the size of any stake they can take in an individual firm, and have fiduciary and governance incentives that make diversification a more desirable strategy (Monks and Minow 1995, chap. 2). Overall, the relative numbers of institutions in each group support Porter's (1992, 8) argument that U.S. institutional investors are unlikely to take substantial ownership positions in firms, but rather are likely to take small, highly diversified stakes and/or turnover these positions frequently.

Panel C of table 6 documents the persistence of cluster membership across time. Institutions classified as quasi-indexer and dedicated tend to maintain that classification into the future, as over 80 percent (75 percent) of these institutions are in the same cluster group one (three) years hence. On the other hand, the majority of transient institutions move to another group in subsequent periods. In the next year (and three years hence), only about 40 percent of transient institutions remain classified as such; over 55 percent are classified in the quasi-indexer category in subsequent years. The factor that drives the instability of the transient classification is the MOMEN factor, which is higher in the year the institution is classified as transient. Thus, many institutions appear to change the amount of momentum trading they do over time, indicating that such institutional trading strategies are not as persistent across time as might be expected.

Results for Predominant Ownership by Different Groups of Institutional Investors

Table 7 presents results for the logit regression of CUTRD on the control variables and institutional holdings including the indicator variables for predominant ownership by transient, dedicated, and quasi-indexer institutions (see equation (2)). The restriction that firms have at least 5 percent institutional ownership reduces the sample sizes relative to table 4 (see the last row of table 7). Column 1 presents results for the SD sample. The only change in the significance of the control variables between table 4 and table 7 is that the coefficient on SIZE is no longer significant. This lack of significance is caused by constraining the sample to only include firms with greater than 5 percent institutional ownership (which are primarily larger firms) and not due to the addition of the indicator variables for holdings by group. Consistent with H2a, firms with an extremely high proportion of ownership by transient institutions are significantly more likely to cut R&D.²⁶ The coefficient on the transient indicator variable is insignificant in both the IN and LD samples, indicating that extreme transient ownership only influences the decision to cut R&D for firms with small declines in earnings. This evidence supports the concern of Porter (1992), Jacobs (1991), Graves and Waddock (1990), and others that transient institutional investor behavior leads to myopic R&D investment behavior.

The results indicate that extreme proportions of ownership by dedicated institutions and by quasi-indexers have no incremental impact on the likelihood of R&D cuts in any of the subsamples. For dedicated institutions, the lack of any significant incremental impact probably stems from the fact that any effect of dedicated ownership is difficult to detect due to the limited number of cases in which dedicated institutions own majority shares of

²⁵ Many institutions that maintain numerous funds, such as Fidelity and Dreyfus, are split between transient and quasi-indexer categories across years in the sample. These switches in category likely occur when one set of funds within the fund family has an exceptionally good year or receives a larger influx of new money, tilting the average portfolio characteristics toward these funds.

²⁶ The coefficient on the transient indicator variable is also significantly positive ($p = 0.03$) when defined using quartiles, and insignificantly positive ($p = 0.16$) when defined using terciles.

TABLE 7
Logit Regression of Indicator for Cut in R&D (CUTRD) on Control Variables and
Institutional Holdings By Group of Institution

$$\begin{aligned}
 Prob(CUTRD_i = 1) = & F[\alpha + \beta_1 PCRD_i + \beta_2 CIRD_i + \beta_3 CGDP_i + \beta_4 TOBQ_i \\
 & + \beta_5 CCAPIX_i + \beta_6 CSALES_i + \beta_7 SIZE_i + \beta_8 DIST_i + \beta_9 LEV_i \\
 & + \beta_{10} FCF_i + \beta_{11} PIH_i + \beta_{12} DQ5(Transient)_i \\
 & + \beta_{13} DQ5(Quasi-indexer)_i + \beta_{14} DQ5(Dedicated)_i]
 \end{aligned}$$

Variable	Expected Sign	SD Sample ^a		IN Sample		LD Sample	
		Coefficient (p-value)	Marginal Effects ^c	Coefficient (p-value)	Marginal Effects	Coefficient (p-value)	Marginal Effects
Intercept ^b		-0.184 (0.424)		0.595 (0.000)		0.207 (0.305)	
PCRD	-	-0.484 (0.008)	-0.029	-0.629 (0.000)	-0.027	-0.379 (0.004)	-0.027
CIRD	-	-0.982 (0.000)	-0.037	-0.742 (0.000)	-0.019	-0.762 (0.000)	-0.030
CGDP	-	-0.791 (0.820)	-0.002	-4.877 (0.025)	-0.011	-3.332 (0.286)	-0.010
TOBQ	-	-0.099 (0.068)	-0.016	-0.037 (0.202)	-0.007	-0.065 (0.256)	-0.008
CCAPX	-	-0.521 (0.000)	-0.077	-0.425 (0.000)	-0.045	-0.216 (0.002)	-0.039
CSALES	-	-1.917 (0.000)	-0.062	-3.012 (0.000)	-0.092	-1.720 (0.000)	-0.084
SIZE	-	-0.031 (0.390)	-0.016	-0.212 (0.000)	-0.085	-0.071 (0.045)	-0.037
DIST	+ ^d	0.232 (0.221)	0.023	-0.025 (0.028)	-0.006	0.060 (0.000)	0.037
LEV	+	0.863 (0.014)	0.041	0.681 (0.001)	0.022	1.058 (0.000)	0.060
FCF	-	0.119 (0.557)	0.006	-0.461 (0.000)	-0.016	0.141 (0.426)	0.008
PIH	+/-	-0.946 (0.016)	-0.060	-0.096 (0.671)	-0.005	-0.269 (0.655)	-0.016
DQ5(Transient)	+	0.365 (0.015)	0.007	-0.067 (0.464)	-0.001	-0.062 (0.655)	-0.001
DQ5(Quasi-indexer)	+/-	0.166 (0.240)	0.003	-0.144 (0.116)	-0.002	0.030 (0.821)	0.001

(Continued on next page)

TABLE 7 (Continued)

Variable	Expected Sign	SD Sample ^a		IN Sample		LD Sample	
		Coefficient (p-value)	Marginal Effects ^c	Coefficient (p-value)	Marginal Effects	Coefficient (p-value)	Marginal Effects
DQ5(Dedicated)	—	0.207 (0.167)	0.003	0.107 (0.200)	0.002	0.214 (0.137)	0.003
pseudo-R ²		0.143		0.221		0.121	
N		1826		6384		1995	

^a The SD sample consists of all firm-years for which $-RD_{t-1} < (EBTRD_t - EBTRD_{t-1}) < 0$. The IN sample consists of all firm-years for which $(EBTRD_t - EBTRD_{t-1}) > 0$. The LD sample consists of all firms for which $(EBTRD_t - EBTRD_{t-1}) < -RD_{t-1}$. $EBTRD_t$ is earnings before taxes and R&D. The samples are restricted to firms with greater than 5 percent total institutional holdings.

^b $DQ5(GROUP_k)_i$ equals one if the proportion of ownership by group k (k = quasi-indexer, transient, dedicated) in firm i is in the top quintile of its distribution. All other variables are defined in table 1.

^c The marginal effect represents the change in the probability that the firm cuts in R&D given a change in the independent variable over the interquartile range (i.e., from the 25th percentile to the 75th percentile).

^d The expected sign for $DIST$ only applies to the SD sample. If earnings smoothing (big bath) incentives motivate managers of firms in the IN (LD) sample, a positive (negative) sign is expected in the IN (LD) sample.

firms.²⁷ For quasi-indexer ownership, the lack of results is probably due to the high correlation between extreme quasi-indexer ownership and overall institutional ownership, of which quasi-indexers are the largest group.

VII. SUMMARY AND CONCLUSIONS

This paper contributes to the ongoing debate about the short-term focus of U.S. managers and investors by providing evidence on the influence of institutional investors on the investment behavior of managers facing incentives to cut R&D to maintain earnings growth. The results indicate that managers are significantly less likely to cut R&D to reverse an earnings decline when institutional ownership is high. This evidence supports the view that, relative to individual investors, the large stockholdings and sophistication of institutional investors allows them to monitor and discipline managers, ensuring that managers choose R&D levels to maximize long-run value rather than to meet short-term earnings goals. However, given a significant level of institutional ownership, a high proportion of ownership by institutions exhibiting transient ownership characteristics (i.e., high portfolio turnover, diversification, and momentum trading) significantly increases the probability that managers reduce R&D to boost earnings. This result supports the widely-argued view that short-term-oriented behavior by institutions creates pressures for managers to sacrifice R&D for the sake of higher current earnings, but only for a sample of firms with extremely high levels of transient ownership and not for the U.S. market, or for institutional investors, as a whole.

Some important caveats must be mentioned in these interpretations of the results. First, the evidence on the relation between transient institutional ownership and the decision to

²⁷ Within the top quintile of proportional ownership by dedicated institutions, the mean holdings of dedicated institutions is less than 20 percent, compared to mean holdings of 94 percent (70 percent) for quasi-indexer (transient) institutions in the top quintile of their respective distributions. As a result, 21[25] firms have values of 1 for both $DQ5(Dedicated)$ and $DQ5(Quasi-indexer)$ [$DQ5(Transient)$] in the SD sample.

cut R&D must be interpreted with some caution due to the time-series instability of membership in the transient group. This instability indicates that transient behavior does not persist over time, but this fact works against a finding that past institutional behavior influences current managerial decisions. Second, the theory and the interpretations of the findings are framed in terms of institutional investor influence on managerial decisions to reduce R&D to manage earnings; but in an association test, it is always difficult to establish causality. I address other explanations for the relation, such as self-selection by institutions in the firms they choose, by examining various sample partitions, by comparing changes in R&D to levels of institutional ownership, and by examining concurrent and future changes in institutional ownership. The body of evidence produced by these approaches is most consistent with institutional investors influencing managerial behavior rather than vice versa. Finally, the process by which managers can manipulate R&D to meet earnings goals is not widely understood, and is difficult to document with publicly available data. This limitation makes it difficult to include specific controls for differences in the cost of cutting R&D across firms, and ultimately makes it difficult to discern whether managers permanently cut R&D or temporarily postpone it across fiscal periods. I try to overcome this limitation by including control variables, such as indicators for the average composition of R&D in the firm's industry and future values of R&D and earnings, but more detailed, small sample research is needed to fully understand the mechanics of managerial myopia.

Given these caveats, this paper provides the first large-sample cross-sectional evidence of institutional investor behavior contributing to the myopic investment problem in the U.S. I find this evidence by focusing on a specific situation—reducing R&D to reverse an earnings decline—and by partitioning institutions directly on the investment behavior argued to create incentives for myopic investment behavior. In doing so, this paper also develops a new method for classifying institutional investors into groups based on past investment behavior. This classification is applicable to other contexts, such as explaining market reactions to earnings announcements, that will be explored in future research. Finally, this study motivates further research into the current trend toward more active investor targeting and investor relations by firms as the evidence indicates that different compositions of institutional owners affect managerial decisions.

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The Expected Rate of Return on Pension Funds and Asset Allocation as Predictors of Portfolio Performance

Eli Amir

Columbia University

Shlomo Benartzi

University of California, Los Angeles

ABSTRACT: We examine the correlation between the expected rate of return on pension assets (ERR), as reported in the financial statements, and the composition of the pension portfolio, measured as the percent invested in equities (% Equity). Our evidence indicates that ERR and %Equity are related, but the relation is rather weak. We also examine whether ERR and %Equity are correlated with future returns on pension assets. Only %Equity is correlated with future pension returns. Our results suggest that the FASB should consider the enforcement rather than elimination of current disclosure requirements regarding pension asset composition.

Key Words: *Pension accounting, Pension asset allocation, Actuarial assumptions, Expected rate of return on pensions.*

Data availability: *Please contact the second author.*

I. INTRODUCTION

Statement of Financial Accounting Standards (SFAS) No. 87 (FASB 1985, para. 54d) requires corporations to disclose the long-term expected rate of return on pension assets (ERR) and the types of assets held in the pension portfolio (para. 54a). While all corporations disclose the ERR, only a few disclose information about the composition

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of assets in their pension funds. Furthermore, when asset allocation is disclosed, the disclosure is often vague. In an attempt to determine the extent of typical asset allocation disclosures, we reviewed the financial statements of 31 firms that were selected by the Association for Investment Management and Research (AIMR) for their excellence in corporate reporting during 1992.¹ We exclude four firms from this analysis because they do not sponsor a defined benefit pension plan. Of the remaining 27 companies, 24 provide no more than a statement indicating that pension assets consist of bonds and stocks. Surprisingly, only three firms of this AIMR elite group provide detailed asset allocation information, i.e., the percent invested in bonds, stocks, and other asset categories (see the appendix).

Recently, the Financial Accounting Standards Board (FASB) has issued Statement of Financial Accounting Standards (SFAS) No. 132 eliminating the requirement to disclose asset composition (FASB 1998). The Board has considered the claim that, in practice, asset composition and certain other pension disclosures "provide only limited useful information to users of financial statements" (FASB 1997, para. 46). The Board has also considered the recommendation of the American Institute of Certified Public Accountants (AICPA) Special Committee on Financial Reporting, which states that "standard setters should search for and eliminate less relevant disclosures" (FASB 1998, para. 17). Given the prevalent practice of vague pension asset composition disclosures and the need to control the cost of preparing and disseminating financial disclosures, the FASB has decided to eliminate asset composition disclosures and to retain the disclosure of the ERR (FASB 1998, para. 49).

In this study, we examine the relevance of disclosures of pension asset composition and of the ERR.² Because the financial statement disclosures of pension fund asset composition are vague, pension asset composition information is taken from a proprietary database that is described later. We adopt the Exposure Draft's notion that relevant information is useful in forecasting pension benefits or costs in future periods (FASB 1997, para. 24; 1998, para. 25). We implement this approach by investigating the ability of both ERR and pension asset composition information to predict the return on pension assets.³ The predictability of return on pension assets is a reasonable vehicle for evaluating the relevance of pension disclosures because the return is economically significant for many firms. For example, we find that the dollar aggregate return on pension assets is (on average) 46 percent of the aggregate earnings before extraordinary items for S&P 500 firms over the period 1991–1995. This suggests that the prediction of pension returns is likely to play a significant role in predicting earnings.⁴

We begin our tests by examining the correlation between the percentage of pension assets that are equity securities (%Equity) and the ERR.⁵ If firms report an unbiased estimate of the ERR, then cross-sectional differences in the ERR should reflect cross-sectional differences in the riskiness of the pension portfolio. Everything else being equal, plan sponsors with more equity securities should use a higher ERR than sponsors with less equity securities. Similarly, the difference in ERRs between an all-equity portfolio and an all-debt portfolio should reflect the equity risk premium observed in the financial markets. We find

¹ We chose 1992 rather than a more recent year because 1992 is the latest year for which the AIMR reports are available in our library.

² In a related study (Amir and Benartzi 1998), we examine whether the asset composition of pension funds is affected by disclosure standards.

³ Landsman (1986) and Barth (1991) adopt a different perspective; they assess the usefulness of pension data in explaining market values.

⁴ White et al. (1994, 672–677) highlight the importance of analyzing pension performance in the context of estimation of future cash flows.

⁵ If %Equity and ERR are highly correlated, then it does not really matter which one is disclosed.

that the correlation between %Equity and the ERR is relatively weak. In addition, the difference between the ERR of an all-equity fund and that of an all-debt fund is only 1 percent, much lower than the historical difference of 4.8 percent between the return on large company stocks and long-term bonds (Ibbotson 1996). It is also lower than the 2.5 percent differential that corporate pension sponsors reported as their long-term expectation in an independent survey conducted by Greenwich Associates (1995, 24).

Our primary tests focus on which of the two alternative measures—ERR or %Equity—better predicts pension investment performance. The results indicate that %Equity is positively correlated with the future actual return on pension assets and that the ERR is not significantly associated with the future actual return on pension assets. Interestingly, the FASB's Exposure Draft proposes elimination of the more relevant disclosure (%Equity). Our results indicate that pension asset composition is relevant information. While it is always hazardous to make any policy recommendation on the basis of a single study, our results suggest that the FASB should consider the enforcement rather than elimination of current disclosure requirements regarding pension asset composition.

We organize the study as follows. Section II provides background and reviews the relevant literature on the choice of estimation parameters. Section III describes the proprietary pension asset composition data that allows the conduct of our tests. Section IV presents results on the correlation between pension asset composition and ERR. Section V presents evidence that %Equity is a better predictor of returns on the pension portfolio than ERR. Section VI summarizes our findings and discusses policy implications for the disclosure changes the FASB is currently implementing.

II. BACKGROUND AND LITERATURE REVIEW

The measurement of pension liabilities and annual expense under SFAS No. 87 (FASB 1985) depends on three parameters disclosed in the financial statements: the discount rate, the rate of compensation increase, and the expected long-term rate of return on pension assets. The first two parameters determine the present value of the accumulated and projected benefit obligation (ABO, PBO) and the service-plus-interest-cost components of the pension expense. The third parameter, ERR, determines the return on plan assets that offsets the service-plus-interest cost components of the pension expense. It is the expected, rather than the actual, return that affects reported income. For example, an increase in ERR will cause a decrease in net pension expense, and hence, an increase in reported net income. Differences between the assumed and actual returns do not enter the income statement unless they exceed a cutoff of 10 percent of the larger of the PBO or the fair value of pension assets. SFAS No. 87 requires that the ERR be determined on the basis of prior experience and performance expectations. Thus, the ERR is expected to be sensitive to changes in the expected rates of return on the various types of assets included in the fund's portfolio and changes in the portfolio composition.

A change in the ERR may have a significant effect on net income. Alster (1993) argues that firms increase pension credits by choosing a high ERR. For example, McDonnell Douglas increased its ERR from 8.3 percent to 9.3 percent in 1992, inflating its pension credit by \$75 million (23 percent of net income). General Electric increased its ERR in 1991 from 8.5 percent to 9.5 percent and booked an after-tax pension credit of \$380 million. Without this credit, GE's net income would have declined by 2.5 percent instead of the reported increase of 2.4 percent.

Prior research has confirmed the relation between actuarial assumptions and proxies for earnings management. For example, Feldstein and Morck (1983) find that firms select the pension discount rate to reduce both the level of pension underfunding and the level of

total debt relative to total assets. They conclude that firms do engage in strategic attempts to reduce their reported unfunded vested pension liabilities. Amir and Gordon (1996) show that firms select the discount rate and health care cost trend rate to manage the accumulated post-retirement benefit obligation reported under SFAS No. 106 (FASB 1990). They show that firms with relatively high leverage select more aggressive (obligation-reducing) estimation parameters to minimize the probability of violating debt covenants. They also find that firms reducing post-retirement benefits select more conservative (obligation-increasing) estimation parameters, possibly to decrease labor renegotiations costs.

Blankley and Swanson (1995) examine whether reported actuarial assumptions under SFAS No. 87 are biased. They find that the average pension discount rate was slightly overstated relative to either the average yield on high quality corporate bonds or the yield on 30-year government bonds. They also find that ERRs are rarely changed and that the average ERR matches actual returns over the 1990–1994 period. They conclude that “the overall evidence does not support the contention of widespread abuse of SFAS No. 87 implied in the business press” (3).

The prior pension studies that are related to our work have focused on whether managers set or change pension parameters to “manage” the content of their financial statements. There is some controversy about whether such management impairs or enhances the usefulness of financial statements (e.g., Dechow 1994, 5). In contrast, our study directly investigates the usefulness of pension disclosures to financial statement users. We focus on determining the usefulness of two variables—ERR and %Equity. ERR is potentially influenced by investment decisions (the composition of the pension portfolio) and reporting discretion (the disclosed expected return), while %Equity is only influenced by investment decisions. If ERR is not managed opportunistically, we would expect no difference in the ability of ERR and %Equity to predict future returns on pension assets. Opportunistic management of ERR would tend to make the ERR less useful for predicting future returns on pension assets.

III. DATA

Our main sample period consists of fiscal years 1991–1994. We chose this sample period because data on pension assumptions became available on Compustat starting in 1991. In addition to this sample period, we collected data from 1988 (the first fiscal year SFAS No. 87 was fully implemented) to 1990.

We obtained data on pension asset composition from the annual *Pensions and Investments* asset allocation survey. This survey includes data on the largest 1,000 pension funds, many of which are sponsored by private firms, unions and government entities rather than by publicly traded corporations. As indicated in table 1, we obtained complete pension asset composition data for approximately 300 publicly traded corporations per year, yielding 2,263 firm/year observations over fiscal years 1988–1994 (*Pensions and Investments* 1988–1994). We deleted 238 firm/year observations that specified more than 5 percent of their pension assets as “other.” Because there is generally a return premium for equity investments over debt investments, some of our tests assume that future return on pension assets should be higher for equity portfolios than debt portfolios. The return on “other” assets depends on the types of investments that are included in the portfolio. Without detailed information on the types of investments in the “other” category, we cannot assess the expected future returns. We also deleted 64 observations of firms that were not covered by Compustat, resulting in a sample of 1,961 firm/year observations with complete pension asset allocation data.⁶ The availability of the ERR further reduced our sample to 1,490

⁶ Friedman (1983) obtained 1977 asset allocation data for 1,836 Compustat firms from Form 5500 filings.

TABLE 1
Sample Selection Criteria

<i>Selection Criterion</i>	<i>1988</i>	<i>1989</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>ALL</i>
1. Publicly traded companies included in the <i>Pensions and Investments</i> survey of asset allocation	288	323	343	326	357	294	332	2,263
2. Less than 5% of assets are classified as "other"	274	286	311	297	309	254	294	2,025
3. The corporation is covered by Compustat	246	290	315	302	272	238	298	1,961
4. The expected rate of return on pension assets is available	205	236	250	215	204	175	205	1,490

observations.⁷ The aggregate market value of pension assets for our sample is \$331 billion as of 1992, representing 30.3 percent of the U.S. corporate defined benefit pension assets (Greenwich Associates 1995).

The ERR varies significantly across firms, as indicated in table 2. The ERR ranges between a low of 6.00 percent and a high of 13.00 percent. The mean ERR for pension funds during the sample period is 9.27 percent (ranging from 9.14 percent in 1994 to 9.45 percent in 1991). The median ERR is typically 9.00 percent. Most firms report ERRs

⁷ We deleted many observations because Compustat codes the parameters as missing when a range for the estimate (e.g., pension discount rate) is provided instead of a point estimate.

TABLE 2
Distribution of the Expected Rate of Return on Pension Assets (ERR)
Percent of Firms in Specified ERR Range

<i>Range of ERR</i>	<i>1988 (n=205)</i>	<i>1989 (n=236)</i>	<i>1990 (n=250)</i>	<i>1991 (n=215)</i>	<i>1992 (n=204)</i>	<i>1993 (n=175)</i>	<i>1994 (n=205)</i>	<i>ALL (1,490)</i>
6.00–6.99%	0.49%	0.00%	0.00%	0.00%	0.00%	0.57%	0.49%	0.20%
7.00–7.99	7.80	4.66	4.80	3.26	3.92	4.57	1.95	4.40
8.00–8.99	22.44	22.46	22.40	19.07	22.06	25.15	25.36	22.60
9.00–9.99	40.97	44.92	42.80	43.72	46.08	45.71	53.66	45.30
10.00–10.99	21.95	19.49	22.40	25.11	21.57	21.15	18.05	21.40
11.00–11.99	5.86	6.78	5.60	6.98	4.90	2.29	0.49	4.80
12.00–13.00	0.49	1.69	2.00	1.86	1.47	0.56	0.00	1.20
Mean	9.21	9.29	9.31	9.45	9.28	9.17	9.14	9.27
Std. Error	1.02	0.97	0.98	0.95	0.93	0.84	0.74	0.93
Median	9.00	9.00	9.05	9.50	9.12	9.00	9.00	9.00

between 8 percent and 11.00 percent.⁸ It is interesting to note that the annual standard error of the ERR decreases from year to year starting with 1.02 percent in 1988 (the first year after the adoption of SFAS No. 87) and ending with 0.74 percent in 1994.

We report changes in ERR over time in table 3. The sample includes different firms in each year so only firms with complete asset composition data for two consecutive years are included in table 3 (a total of 811 observations). Many firms were excluded from the analysis because they did not complete the *Pensions and Investments* survey on a consistent basis. For example, the 1989 sample includes only 123 firms because 82 of the original 205 firms in the 1988 sample did not complete the 1989 *Pensions and Investments* survey. The results indicate that most firms maintain a stable ERR over time. As shown in panel A of table 3, about three-quarters of the firms do not change the ERR from year to year. Over a longer period of time (1988–1994), about a third revise their ERR upward, a third revise downward and a third remain stable (see panel B of table 3).

Table 4 (panel A) includes descriptive statistics on the asset allocation of the pension funds in our sample. On average, U.S. pension funds invest about half their funds in domestic equities and an additional one-third in domestic fixed-income securities. The share of pension assets invested in domestic equities increased from 48.30 percent in 1988 to 52.47 percent in 1994. Investments in international equities increased from 2.25 percent in

⁸ According to the 1990 *Accounting Trends and Techniques* (AICPA 1991), the median ERR is 9.00 percent and the range is from 6.00 percent to 11.50 percent. The actual annual rates of return during 1991–1995 were 13.6 percent, 7.5 percent, 9.3 percent, 0.6 percent and 16.3 percent, respectively (see Amir and Benartzi 1997, exhibit 1).

TABLE 3
Frequency of Changes in the Expected Rate of Return on Pension Assets^a

<i>Year</i>	<i>1989</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>
<i>Panel A: Relative to the Previous Year</i>						
(n)	(123)	(165)	(147)	(140)	(117)	(119)
Decrease	8.9%	6.7%	8.2%	12.1%	17.9%	20.2%
No change	75.6	76.4	77.6	78.6	78.6	73.9
Increase	15.4	17.0	14.3	9.3	3.4	5.9
<i>Panel B: Relative to 1988</i>						
(n)	(123)	(116)	(99)	(95)	(86)	(91)
Decrease	8.9%	11.2%	13.1%	21.2%	29.1%	31.8%
No change	75.6	57.8	55.6	44.1	37.2	35.2
Increase	15.4	31.0	31.3	34.7	33.7	33.0

^a The table presents the percentage of firms that increased, decreased or maintained their expected rate of return (ERR). Changes in ERR are presented relative to the previous year (panel A) or relative to 1988 (panel B). The number of observations is reported in parenthesis. Many firms were excluded from the analysis because they did not complete the *Pensions and Investments* survey on a consistent basis. For example, the 1989 sample includes only 123 firms because 82 of the original 205 firms in the 1988 sample did not complete the 1989 *Pensions and Investments* survey.

TABLE 4
Composition of Pension Assets*

Panel A: All Observations

<i>Asset Category</i> <i>(n=)</i>	<i>1988</i> <i>(205)</i>	<i>1989</i> <i>(236)</i>	<i>1990</i> <i>(250)</i>	<i>1991</i> <i>(215)</i>	<i>1992</i> <i>(204)</i>	<i>1993</i> <i>(175)</i>	<i>1994</i> <i>(205)</i>	<i>ALL</i> <i>(1,490)</i>
Cash Equivalent	11.39%	9.06%	10.04%	6.47%	5.01%	4.26%	3.98%	7.35%
Domestic Bonds	26.62	28.82	30.38	31.46	34.21	31.35	29.55	30.30
Intl. Bonds	0.34	0.37	0.36	0.27	0.27	0.48	0.56	0.37
GICs ^b	3.78	3.71	3.63	1.83	2.01	1.80	1.87	2.72
Annuities	0.67	0.65	1.15	0.55	0.33	0.53	0.39	0.63
Domestic Stocks	48.30	49.68	45.64	51.00	50.00	51.99	52.47	49.70
Intl. Stocks	2.25	2.81	2.95	3.34	3.75	4.79	6.36	3.68
Real-Estate Equity	4.76	3.86	4.30	3.91	3.33	3.18	3.16	3.82
Mortgages	0.29	0.12	0.49	0.30	0.35	0.47	0.79	0.39
Mortgage-Backed	0.75	NA	NA	NA	NA	NA	NA	0.10
Oil & Gas Partner.	0.01	0.03	0.07	0.08	0.03	0.07	0.07	0.05
LBOs ^c	0.05	0.09	0.08	0.07	0.02	0.10	0.06	0.07
Venture Capital	0.54	0.52	0.50	0.39	0.31	0.45	0.42	0.45
Private Placement	0.09	0.07	0.19	0.13	0.08	0.10	0.04	0.10
Other Investments	0.17	0.21	0.21	0.21	0.28	0.40	0.31	0.25

Panel B: Observations with Less Than 20% in Equity

<i>(n=)</i>	<i>(14)</i>	<i>(9)</i>	<i>(19)</i>	<i>(7)</i>	<i>(8)</i>	<i>(7)</i>	<i>(6)</i>	<i>(70)</i>
Cash Equivalent	23.29%	17.22%	25.68%	32.43%	7.13%	3.14%	18.67%	19.81%
Domestic Bonds	48.57	53.11	48.05	35.29	79.38	80.57	58.83	55.29
Intl. Bonds	0.36	0.00	0.68	0.00	0.00	0.71	0.00	0.33
GICs ^b	11.43	19.11	13.37	20.14	1.00	1.86	3.17	10.96
Annuities	0.93	1.33	1.37	4.00	0.00	0.00	0.00	1.13
Domestic Stocks	9.29	6.11	4.95	5.57	10.50	5.71	9.00	7.09
Intl. Stocks	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.01
Real-Estate Equity	3.07	1.89	3.84	1.86	0.88	1.29	1.67	2.46
Mortgages	0.43	0.00	1.26	0.14	0.00	5.43	8.17	1.69
Mortgage-Backed	1.50	NA	NA	NA	NA	NA	NA	0.30
Oil & Gas Partner.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LBOs ^c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

(Continued on next page)

TABLE 4 (Continued)

Panel B: Observations with Less Than 20% in Equity (Continued)

<i>Asset Category (n=)</i>	<i>1988 (14)</i>	<i>1989 (9)</i>	<i>1990 (19)</i>	<i>1991 (7)</i>	<i>1992 (8)</i>	<i>1993 (7)</i>	<i>1994 (6)</i>	<i>ALL (70)</i>
Venture Capital	1.14	1.22	0.37	0.43	1.13	0.86	0.50	0.79
Private Placement	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Investments	0.00	0.00	0.42	0.00	0.00	0.43	0.00	0.16

^a Pension asset composition data is from the annual *Pensions and Investments* survey. Asset categories are not identical across time, resulting in missing (NA) values.

^b GICs are guaranteed investment contracts.

^c LBOs are typically high risk equity investments in highly leveraged firms.

1988 to 6.36 percent in 1994, reflecting increased investment globalization. The share of domestic bonds in the pension funds increased from 26.62 percent in 1988 to 29.55 percent in 1994.⁹ Of the allocation to bonds, investments in noninvestment-grade (junk) bonds are negligible. During 1991–1994 the amount allocated to junk bonds was 0.19 percent, 0.25 percent, 0.25 percent and 0.18 percent, respectively (not reported in the table). Thus, the existence of bonds that are possibly riskier than stocks has no effect on our analysis. To compensate for the higher allocations to stocks, investments in cash equivalents and real estate equities decreased from 11.39 percent and 4.76 percent in 1988 to 3.98 percent and 3.16 percent in 1994.

Panel B of table 4 describes the asset allocation of pension funds with less than 20 percent invested in equity securities. Very few firms (as few as six firms in 1994 and as many as 19 in 1990) allocate less than 20 percent of their pension assets to equity securities. Interestingly, these firms do not attempt to offset their low equity exposure via venture capital and other risky assets, but rather they have very little invested in venture capital and private placements. Therefore, the percentage of equity investments is a reasonable proxy for portfolio risk, as firms with relatively fewer equities do not favor other risky investments.

Pension asset composition varies significantly across plan sponsors. While some plan sponsors have no equities in the pension portfolio, others have equities only. The median %Equity is 52.50 percent, 57.00 percent and 62.00 percent for 1988, 1991 and 1994, respectively. The standard error of the %Equity is 16.91 percent, 15.85 percent, and 14.88 percent for 1988, 1991 and 1994 (not reported in a table). Over time, firms have shifted more funds to equity investments, reducing differences in asset composition across firms.

IV. THE ASSOCIATION BETWEEN ASSET COMPOSITION AND ERR

If the ERR is an unbiased expectation of the return on the pension portfolio, there should be a positive correlation between the percentage of equity in the fund and the disclosed ERR. Firms with high equity exposure take relatively more risk and are expected

⁹ Benartzi and Thaler (1995) provide an explanation for the observed split of roughly 60 percent equities and 40 percent fixed income securities.

to earn higher returns.¹⁰ Consequently, we first analyze the relation between ERR and %Equity via a nonparametric portfolio analysis. We divide our annual samples into deciles, according to the firm's %Equity, and calculate the average ERR for each decile. Panel A of table 5 presents the decile information for each year 1988–1994 and the pooled sample. We use the information for the first and tenth deciles to estimate the implied equity risk premium for each year and the pooled sample. These equity risk premiums are displayed in the last line of panel A in table 5. The pooled sample reveals that the difference between the average ERR for the first and the tenth decile is only 0.39 percent, and that the difference in equity allocation between these two deciles is 58 percent. These differences are consistent with an average risk premium of 0.67 percent, significantly lower than the historical risk premium observed in financial markets (see Ibbotson 1996).¹¹

Panel B of table 5 reports the Pearson and Spearman correlations between the %Equity and the ERR for each year and the pooled sample. The correlations are calculated at the individual firm level rather than the portfolio level. For the first five years of our sample period (1988–1992), the Pearson correlations are small and insignificantly different from zero (at the 0.10 level). Spearman rank correlations are also close to zero and generally insignificant at the 0.10 level. For the last two years of our sample (1993–1994), the Pearson (Spearman) correlations are 0.35 and 0.31 (0.27 and 0.21) and are significantly different from zero at the 0.01 level.

We also examine the relation between changes in %Equity between 1988 and each of the years 1989–1994 and year-to-year changes in the ERR over the same six years. Results, which are not reported in a table here, indicate a weak and statistically insignificant relation between changes in the %Equity and changes in the ERR.

Next, we use a multivariate regression model to investigate the cross-sectional variance in the ERR. There are several reasons for exploring a multivariate model. First, while many firms allocate all their pension funds between equities and bonds, certain firms allocate funds to venture capital, LBOs, private placements, and other investments. Assuming that

¹⁰ We conducted the following experiment: First, using data from 1926 to 1995, we created five portfolios using the Lehman Brothers Aggregate Bond Index and the S&P 500 index. The %Equity increases from 0 percent in portfolio No. 1 to 100 percent in portfolio No. 5. The following table shows that as %Equity increases, both the average return and its standard deviation increase monotonically. Thus, %Equity is correlated with standard proxies for risk.

<u>%Equity</u>	<u>Average Return</u>	<u>Std. Deviation</u>	<u>Minimum Return</u>
0%	5.80%	6.83%	-8.10%
25	7.48	8.03	-12.27
50	9.15	11.49	-22.65
75	10.83	15.80	-33.02
100%	12.51%	20.42%	-43.40%

¹¹ To calculate the implied risk premium based upon all observations, consider the following system of two equations where RE represents the return on equities and RB represents the return on bonds:

$$\begin{aligned} 0.181RE + 0.819RB &= 9.10 && \text{1st Decile (low \%Equity)} \\ 0.761RE + 0.239RB &= 9.49 && \text{10th Decile (high \%Equity)} \end{aligned}$$

Solving these equations yields $RB = 8.98\%$ and $RE = 9.65\%$, a risk premium of 0.67%.

TABLE 5
Association Between the Percentage Invested in Equities (%Equity) and the Expected Rate of Return (ERR)

Decile of %Equity	1988 (n=205)		1989 (n=236)		1990 (n=250)		1991 (n=205)		1992 (n=204)		1993 (n=175)		1994 (n=205)		ALL (n=1,490)	
	Equity	ERR	Equity	ERR	Equity	ERR	Equity	ERR	Equity	ERR	Equity	ERR	Equity	ERR	Equity	ERR
<i>Panel A: Mean %Equity and ERR</i>																
Less	14.4%	9.07%	18.4%	9.17%	9.8%	9.29%	23.2%	9.36%	20.4%	9.39%	21.4%	8.59%	22.1%	8.62%	18.1%	9.10%
2	34.4	9.58	37.4	9.10	32.0	9.01	39.1	9.43	38.6	8.97	42.4	8.81	44.9	8.96	38.4	9.12
3	43.6	9.21	43.6	9.02	40.7	9.29	48.0	9.34	46.3	9.24	50.9	9.27	53.9	9.18	46.3	9.23
4	48.4	8.93	48.2	9.29	45.9	8.94	52.4	9.57	51.3	9.15	55.0	9.21	57.4	9.10	51.0	9.17
5	50.8	9.15	52.1	9.39	49.9	9.46	54.8	9.78	54.3	9.49	58.1	8.88	59.8	8.93	54.0	9.31
6	54.8	9.00	56.0	9.48	53.5	9.15	58.9	9.52	57.5	9.23	60.5	9.55	62.4	9.25	57.4	9.30
7	57.9	9.06	58.6	9.41	56.9	9.82	61.5	9.45	61.0	9.32	63.7	9.31	65.9	9.32	60.7	9.41
8	61.5	9.07	63.0	9.28	60.1	9.26	64.2	9.35	64.0	9.32	67.8	9.30	68.4	9.39	63.6	9.28
9	66.2	9.16	68.6	9.47	63.9	9.52	67.8	9.27	68.2	9.20	70.8	9.47	71.3	9.22	68.1	9.33
More	74.2	9.83	76.3	9.30	74.5	9.44	76.6	9.52	76.1	9.60	76.1	9.45	79.2	9.38	76.1	9.49
Implied Equity Risk Premium ^a	1.27%		0.22%		0.23%		0.30%		0.38%		1.57%		1.33%		0.67%	

Panel B: Correlation Coefficients between %Equity and ERR^b

Type	Corr.	p-val.	Corr.	p-val.	Corr.	p-val.	Corr.	p-val.	Corr.	p-val.	Corr.	p-val.	Corr.	p-val.	Corr.	p-val.
Pearson	0.08	0.25	0.07	0.25	0.06	0.30	0.07	0.29	0.11	0.11	0.35	0.00	0.31	0.00	0.12	0.00
Spearman	0.06	0.39	0.08	0.19	0.10	0.09	0.01	0.86	0.12	0.08	0.27	0.00	0.21	0.00	0.11	0.00

^a The implied equity risk premium is the difference between the ERR of the top and bottom deciles, divided by the difference between the %Equity of the top and bottom deciles. In 1988, for example, the difference in ERR was 0.76% (9.83% - 9.07%) and the difference in %Equity was 59.8% (74.2% - 14.4%), resulting in an implied equity risk premium of 1.27% (0.76%/59.8%).

^b The correlation coefficients are calculated at the individual firm level rather than the portfolio level.

these investments are, on average, riskier than common equities and bonds, such investments should have a positive (on average) influence on the ERR. In addition, the requirements of SFAS No. 87 imply a positive relation between the ERR and lagged actual return on plan assets. Managers of firms that earned relatively high returns on their pension portfolio in the past may argue that these high returns justify a high ERR. Consequently, these managers are more likely to select a relatively high ERR than managers with lower actual returns. While it is puzzling how portfolio managers can sustain abnormal performance in efficient markets, the evidence in Hendricks et al. (1993) suggests that “hot hands” do persist.

Based on the above discussion, we use the following regression model to examine the relation between the ERR and asset allocation:

$$\text{ERR}_{it} = \alpha_{0t} + \alpha_{1t}\% \text{Equity}_{it} + \alpha_{2t}\% \text{Risky}_{it} + \alpha_{3t}\text{Act\_Ret}_{it} + \epsilon_{it} \quad (1)$$

The variable $\% \text{Risky}_{it}$ represents firm i 's investment in risky assets, such as venture capital, LBOs (high risk equity investments in highly leveraged firms), private placements, and investments classified as “others” at time t . Act_Ret_{it} represents the actual return on plan assets in year t . The ERR is typically determined at the end of the reporting period and affects the assumed return in the following period. Consequently, Act_Ret_{it} represents lagged actual return over the preceding year.

If ERR is a weighted average of expected returns on equity, bonds and other risky investments, the slope coefficient on $\% \text{Equity}$ (α_{1t}) represents the consensus equity risk premium at time t . Similarly, the slope coefficient on $\% \text{Risky}$ represents the consensus risk premium at time t on risky investments, such as private placements and venture capital. We expect all regression coefficients to be positive. In particular, we expect α_{2t} to be larger than α_{1t} .

Table 6 presents estimation results for equation (1). The regression intercepts range from 8.01 in 1993 to 9.27 in 1991, while the pooled model's intercept is 8.61.¹² The coefficients on $\% \text{Equity}$ are all positive, as expected, and significantly different from zero at the 0.10 level or better (one-tailed test) in all years but 1988. However, the equity risk premium implied by these coefficients ranges between 0.50 percent in 1988 and 1.88 percent in 1993, while the pooled model implies an equity risk premium of 1.06 percent.¹³ This implied risk premium is significantly below the equity risk premium of 4.8 percent observed in financial markets over the last seven decades (Ibbotson 1996). The implied risk premium is also lower than the 2.5 percent differential that corporate pension sponsors reported as their long-term expectation in an independent survey conducted by Greenwich Associates (1995). Again, it seems that ERRs are determined by factors other than the portfolio risk. We obtain similar coefficients when $\% \text{Equity}$ is the sole explanatory variable in the regressions (not reported in the table).

The coefficients on $\% \text{Risky}$ (α_{2t}) are positive in all models except for 1991. The coefficient is significant at the 0.10 level (one-tailed test) in 1993, 1994 and the pooled model, while the pooled model suggests a risk premium of 3 percent. The coefficients on Act_Ret are not significant at the 0.10 level (one-tailed test) except in 1994. The lack of significance

¹² The pooled model includes yearly dummy variables (not reported) to allow yearly intercepts to vary.

¹³ Reported regression coefficients were rounded up to the nearest percentage point.

TABLE 6
Association Between the ERR, Pension Asset Composition and Lagged Pension Returns
(Regression Analysis)^a

<i>Year^b</i>	<i>Intercept_{it}</i> (+)	<i>%Equity_{it}</i> (+)	<i>%Risky_{it}</i> (+)	<i>%Act_Ret_{it}</i> (?)	<i>Adj-R²</i> <i>n</i>
1988	8.83	0.01	0.02	0.01	0.00
(t-statistic)	(28.51)	(1.15)	(0.42)	(0.35)	n=165
1989	8.87	0.01	0.03	-0.00	0.00
(t-statistic)	(30.97)	(1.69)	(0.75)	(-0.14)	n=207
1990	8.95	0.01	0.02	0.01	0.00
(t-statistic)	(42.93)	(1.54)	(0.58)	(0.74)	n=218
1991	9.27	0.01	-0.01	-0.01	0.00
(t-statistic)	(32.90)	(1.69)	(-0.34)	(-1.14)	n=208
1992	8.71	0.01	0.03	0.00	0.01
(t-statistic)	(30.08)	(2.23)	(0.58)	(0.13)	n=197
1993	8.01	0.02	0.04	0.00	0.11
(t-statistic)	(28.90)	(4.78)	(1.53)	(0.23)	n=171
1994	8.41	0.01	0.06	0.02	0.08
(t-statistic)	(41.70)	(3.47)	(1.90)	(1.66)	n=198
ALL	8.61	0.01	0.03	0.00	0.04
(t-statistic)	(74.93)	(6.39)	(2.28)	(0.45)	n=1,366

^a Variables are defined as follows: ERR = the expected rate of return on pension assets (dependent variable); %Equity = the percent of pension funds in domestic and international equities; %Risky = the percentage of pension funds allocated to LBOs (high risk equity investments in highly leveraged firms), venture capital and private placements; %Act_Ret = the actual rate of return on pension assets over the preceding year (annual return divided by the average of the beginning and ending plan assets). The sample size was reduced from 1,490 observations to 1,378 because 112 observations were missing rate of return information.

^b Observations with a studentized residual above |3| were deleted, resulting in a pooled sample of 1,366 observations (and total year-by-year observations of 1,364). We report OLS coefficients with t-statistics in parentheses. The pooled regression includes yearly dummy variables (not reported).

suggests that pension returns over the preceding period are not associated with current expected rates of returns on pensions.¹⁴

One of the most notable features of the regression models, whose estimates are displayed in table 6, is their relatively poor explanatory power. Table 6 reveals that the adjusted

¹⁴ It is possible that the relation between ERR and %Equity is stronger for large pension funds than for small pension funds. The reason is that large funds have to invest in a diversified portfolio, given their size. Thus, two large funds with the same allocation to equities will have virtually the same risk and return profile. Small funds, on the other hand, can invest in specialized categories such as biotech stocks. Thus, two small funds with the same allocation to equities might have different risk and return profiles depending on the specific type of equities they elect. For small funds, %Equity is not a good proxy for risk and expected returns. However, we do not expect the size of the pension portfolio to affect any of our results because all the firms in our sample are relatively large. Nevertheless, we divided our sample to three sizes of portfolios according to the dollar amount in the pension assets, and repeated the analysis in tables 5 and 6 for each size subsample. The results are similar across the three subsamples, although the association between ERR and %Risky is stronger in smaller firms. We also repeated the analysis for different levels of funding (low, medium and high funding ratios). The results are almost identical across funding levels.

R^2 is 0.01 or less in the years from 1988 through 1992. The adjusted R^2 for 1993 is 0.11 and 1994 is 0.08. In summary, the evidence clearly indicates that past pension returns and pension asset composition explain a very modest portion of the variation in ERR.

V. ASSET ALLOCATION vs. ERR: WHICH DISCLOSURE BETTER PREDICTS FUTURE PENSION RETURNS?

We evaluate the ERR and pension asset composition by their usefulness in predicting future returns on pension assets. Pension returns constitute a significant portion of the firm's income so predicting pension returns is a key step in earnings prediction. To perform the prediction tests, we collected actual pension returns over 1990–1995 for all firms in the *Pensions and Investments* survey.¹⁵ We define the actual rate of return as the actual dollar return, deflated by the average of the beginning and ending pension assets. We limit the analysis to firms with December fiscal year-ends. Since our asset composition data is generally collected between the months of September and December, this restriction ensures that the measurement of asset composition precedes the measurement of actual returns. Had we measured asset composition subsequent to the measurement of actual returns, it would have been unclear whether asset composition drives returns or vice versa.

We begin our tests with a portfolio analysis. Specifically, we divide each annual sample to quintiles according to the reported ERR (panel A of table 7) and according to the firm's %Equity (panel B of table 7). For each quintile, we calculate the actual return on pension assets over the next one through five years. We use overlapping time periods in the calculation of average returns. For example, in calculating two-year pension returns, we pool together pension returns over 1991–1992, 1992–1993, 1993–1994, and 1994–1995. To ensure that we do not overstate the t-statistics, the t-statistics are based on nonoverlapping periods. For example, the calculation of the t-statistics in the two-year window is based on the pooled 1991–1992 and 1993–1994 data. Similarly, the t-statistics in the three-, four- and five-year windows are based on the 1991–1993, 1991–1994 and 1991–1995 data, respectively. If ERRs and asset composition provide information about future pension returns, then firms that select higher ERRs and firms that invest more heavily in equities should experience higher actual returns over increasingly long windows.

As shown in panel A of table 7, firms with high ERRs often earn lower returns than firms with low ERRs. For example, firms in the first ERR quintile (20 percent of the firms with the lowest ERR) earn, on average, 12.75 percent on their pension portfolio in the subsequent year. In contrast, firms in the fifth quintile (20 percent of the firms with the largest ERRs) earn, on average, 11.19 percent in the subsequent year. Over a five-year period (1991–1995), low-ERR firms earned 11.36 percent on the pension portfolio, whereas high-ERR firms earned slightly less, 10.73 percent. Thus, we can not reject the null hypothesis that the pension returns of low-ERR firms are equal to (or larger than) the pension returns of high-ERR firms. In summary, it seems as though ERR cannot be used to predict future pension returns.

We repeat the analysis forming quintile portfolios based on asset allocation (%Equity). As panel B of table 7 shows, asset allocation explains cross-sectional variation in future actual pension returns. For example, using a one-year return window, firms with the lowest allocation to equities (quintile 1) earn, on average, 10.91 percent in the subsequent year, whereas firms with the largest allocation to equities (quintile 5) earn, on average, 12.28 percent. The difference between the portfolios is significant at the 0.10 level (one-tailed

¹⁵ We did not collect actual returns for 1988 and 1989, because during that period some firms included foreign plans in the returns and others did not.

TABLE 7
Mean Future Rates of Return on Pension Assets by ERR and Asset Allocation

	<i>Mean Rate of Return on Pension Assets Over^a</i>				
	<i>One Year</i> <i>(n=811)</i>	<i>Two Years</i> <i>(n=635)</i>	<i>Three Years</i> <i>(n=496)</i>	<i>Four Years</i> <i>(n=335)</i>	<i>Five Years</i> <i>(n=174)</i>
<i>Panel A: Quintiles are Based on the Beginning ERR^b</i>					
Quintile 1 (Low)	12.75%	9.92%	10.13%	9.50%	11.36%
Quintile 2	11.44	9.48	8.63	9.59	11.82
Quintile 3	10.76	8.99	10.09	9.25	11.24
Quintile 4	12.70	9.97	10.63	9.91	11.66
Quintile 5 (High)	11.19	9.68	10.15	9.57	10.73
t-test: 5 vs. 1 ^c	-1.58	-0.28	0.71	0.81	-0.98
<i>Panel B: Quintiles are Based on the Beginning %Equity^b</i>					
Quintile 1 (Low)	10.91%	9.11%	9.10%	8.71%	10.60%
Quintile 2	11.56	9.52	9.66	9.54	10.92
Quintile 3	12.12	9.66	10.25	9.55	11.47
Quintile 4	12.57	9.77	10.18	9.76	11.62
Quintile 5 (High)	12.28	10.33	10.65	10.47	12.09
t-test: 5 vs. 1 ^c	1.45	2.74	3.50	4.35	3.40

^a The sample consists of firms with December fiscal year-ends included in the *Pensions and Investments* survey and that had available pension assets and actual returns. One-year returns are measured over 1991–1995; two-year returns are measured over 1991–1992, 1992–1993, 1993–1994 and 1994–1995 (overlapping periods). Longer windows are defined in a similar way.

^b The rate of return is defined as the mean annual return, deflated by the average of the beginning and ending market value of pension assets. ERR is the expected rate of return as reported in the financial statements, and %Equity is the percentage of pension assets invested in domestic and international equities.

^c A t-test of the null hypothesis that quintile No. 5 has a smaller or equal return on pension assets than quintile No. 1. The t-statistics are based on nonoverlapping periods. For example, the calculation of the t-statistics in the two-year window is based on the pooled 1991–1992 and 1993–1994 data.

test). Moreover, as the return window increases, firms with higher %Equity earn significantly higher returns. For example, over 1991–1995, firms with low %Equity earned 10.60 percent, while firms with high %Equity earned 12.09 percent, significantly higher at the 0.01 level ($t = -3.40$). Finally, returns on all quintiles exhibit a monotone increase as %Equity increases, providing more credence to the results.

To examine whether the results of our portfolio analysis are affected by omitted correlated variables, we extend our portfolio analysis by conducting a multivariate regression analysis. We design a prediction model where future pension returns are regressed on current values of ERR, %Equity, lagged returns, and the size of the pension fund (Size). In addition, period indicators are included but not reported. We use the following specification:

$$\text{Act\_Ret}_{t+1} = \beta_0 + \beta_1 \text{ERR}_t + \beta_2 \% \text{Equity}_{it} + \beta_3 \text{Act\_Ret}_{it} + \beta_4 \text{Size}_{it} + \eta_{it} \quad (2)$$

Actual return over future periods is calculated over one- to five-year windows similar to the method reported in table 7. The sample size varies from 167 observations to 802, depending on the length of the window. Eleven of the 802 observations had a studentized residual above three in absolute value, and they were deleted to reduce the effect of outliers. To ensure that we do not overstate the t-statistics, the t-statistics are based on nonoverlapping periods as in table 7. Finally, we supplement the *adjusted* R^2 with *incremental* R^2 values, defined as the difference between (1) the R^2 obtained with period indicators and the explanatory variables minus (2) the R^2 obtained with period indicators alone.

The results, which are reported in table 8, indicate that, regardless of the return window, ERRs are not associated with future pension returns. In contrast, allocation to equities is associated with future returns. The coefficients on %Equity are all positive and significant at the 0.10 level or better (one-tailed test). The incremental R^2 increases with the return window, suggesting that risk measures such as %Equity are better predictors of long-term rather than short-term returns. Finally, controlling for past pension returns and the size of the pension portfolio has little effect on our analysis.

TABLE 8
Predicting Rates of Return on Pension Assets: Regression Analysis

<i>Dependent Variable is Act_Ret_{t+k} (the actual rate of return on pension assets over the next k years^a)</i>	<i>Coefficient Estimates (t-values) for the Following Dependent Variables^{b,c}</i>						
	<i>n</i>	<i>Adj-R²</i>	<i>Incr. R^{2d}</i>	<i>ERR_t</i>	<i>%Equity_t</i>	<i>Act_Ret_t</i>	<i>Size_t</i>
k = One Year	791	0.77	0.02	0.14 (0.99)	0.04 (4.34)	-0.24 (-7.03)	0.19 (0.66)
k = Two Years	622	0.54	0.03	0.05 (0.06)	0.03 (2.51)	0.02 (0.75)	0.00 (-0.17)
k = Three Years	481	0.64	0.03	0.12 (0.52)	0.03 (2.19)	-0.05 (-0.83)	0.15 (0.89)
k = Four Years	323	0.09	0.07	0.08 (0.69)	0.03 (2.46)	0.00 (0.44)	0.04 (0.02)
k = Five Years	164	0.14	0.14	-0.11 (-0.82)	0.01 (1.57)	-0.15 (-4.14)	-0.29 (-0.99)

^a The sample consists of December year-end firms that were included in the *Pensions and Investments* survey with available data. One-year returns are measured over 1991–1995; two-year returns are measured over 1991–1992, 1992–1993, 1993–1994 and 1994–1995 (overlapping periods); three-, four- and five-year windows are calculated in a similar manner. The sample size varies from 802 observations (one-year window) to 167 observations (five-year window).

^b The actual rate of return on pensions (Act_Ret) is defined as the mean annual return, deflated by the average of the beginning and ending market value of pension assets. ERR is the expected rate of return as reported in the financial statements. %Equity is the percentage of pension assets invested in domestic and international equities. Size is the LOG₁₀ of pension assets. Period indicators are included but not reported.

^c We report OLS coefficients with t-statistics in parentheses. The t-statistics are based on nonoverlapping periods. For example, the calculation of the t-statistics in the two-year regression is based on the pooled 1991–1992 and 1993–1994 data. Observations with a studentized residual above three in absolute value are deleted, reducing the one-year sample from 802 observations to 791 and the five-year sample from 167 observations to 164.

^d We supplement the adjusted R^2 with an incremental R^2 , defined as the difference between (1) the R^2 obtained with period indicators and our explanatory variables minus (2) the R^2 obtained with period indicators only.

VI. SUMMARY AND CONCLUSIONS

In this study, we assess the relevance of certain pension disclosures to financial statements' users. Consistent with the FASB's definition of a "relevant" pension disclosure, we adopt the approach that users of financial statements desire pension information that is useful in forecasting the cost of future pension benefits. Therefore, we focus on the ability of the expected rate of return on pension assets (ERR) and the percent of pension assets invested in equity securities (%Equity) to predict future returns on the pension portfolio. Given the magnitude of pension returns relative to net income, predicting pension returns is likely to help forecasting net income.

We begin with an examination of the correlation between asset allocation (%Equity) and ERR. If firms report an unbiased estimate of the ERR, then cross-sectional differences in the ERR should reflect cross-sectional differences in the riskiness of the pension portfolio. This implies that plan sponsors with more equity securities should use a higher ERR than sponsors with less equity securities. Using proprietary data on asset composition over the 1988–1994 period, we find that the correlation between the percentage of equities in the pension fund and the ERR is rather weak. In addition, the difference between the ERR of an all-equity fund and that of an all-debt fund is only 1 percent, far smaller than the historical risk premium observed in U.S. financial markets.

Next, we examine which of the two measures—ERR or allocation to equities—is a better predictor of pension investment performance. The results indicate that asset composition is a better predictor of returns on the pension portfolio than the ERR. In particular, we find that among current values of asset compositions, ERRs, pension returns, and the size of the pension fund, asset composition is the only variable with significant prediction power for future pension returns. Moreover, we find that ERR is not at all correlated with future returns on the pension portfolio.

Recently, financial analysts have argued that some pension disclosures, including asset composition disclosures, should be omitted from the financial statements because they provide little information to financial statement users. Based on discussions and comment letters from financial analysts, the FASB has maintained that these pension disclosures tend to be too general and thus are not helpful to users. Our study clearly shows that asset composition is more useful than ERR, current pension return, and the size of the pension fund in predicting long-term pension returns. Without asset composition data, it is difficult to assess the appropriateness of the ERR and adjust reported earnings accordingly.¹⁶ The FASB is actually rewarding companies for providing incomplete asset allocation data by eliminating the required disclosures. Our results indicate that the FASB should consider clarifying and enhancing the disclosure of pension asset composition rather than eliminating this disclosure requirement.

¹⁶ Amir and Benartzi (1997) show how such an adjustment to earnings can be made using asset allocation data.

APPENDIX

Pension Asset Composition Disclosures by Firms that Received the AIMR Award for Excellence in Corporate Reporting¹⁷

<i>Company</i>	<i>Asset Allocation as Disclosed in the 1992 Annual Report</i>
1. Allied Signal	58% equities and 42% fixed income securities.
2. Ashland Oil	Listed stocks, bonds and annuity contracts.

(Continued on next page)

APPENDIX (Continued)

<i>Company</i>	<i>Asset Allocation as Disclosed in the 1992 Annual Report</i>
3. Atlantic Richfield	Stocks and bonds.
4. Ball Corporation	Fixed income securities and common stocks.
5. Browning-Ferris Industries	Commercial paper, common stocks and mutual funds.
6. Capital Holding Corporation	No disclosure of asset allocation.
7. Chevron	Common stocks, bonds, cash and real estate.
8. Cummins Engine	Equity securities, corporate and government obligations.
9. Delta Woodside	No disclosure of asset allocation.
10. Gannett	Insurance contracts, common stocks, bonds and government debt.
11. H. B. Fuller	Listed equity securities and a guarantee contract.
12. Harsco Corporation	Equity and fixed income securities.
13. Honeywell	Fixed income investments and equity securities.
14. Ingersoll-Rand	Balanced between equities, cash and debt securities.
15. MCN Corporation	Equity and fixed income securities.
16. Mellon Bank Corporation	19% cash, 5% corporate debt, 10% company stock and 66% other common stocks.
17. Panhandle Eastern Corporation	Common stock and fixed income securities.
18. PepsiCo	Equities and corporate and government debt.
19. Philips Petroleum	Annuities, commingled funds, real estate, stocks and bonds.
20. Rohm & Haas	Common stocks and debt securities.
21. Sara Lee Corporation	Equities, corporate and government debt and real estate.
22. Schering-Plough Corporation	Stocks and bonds.
23. UAL Company	Government and corporate debt and equities.
24. Union Pacific Corporation	31% in fixed income securities and 69% in equity securities.
25. Valero Energy	No disclosure of asset allocation.
26. VF Corporation	Common stocks, corporate and government debt.
27. Washington Mutual Savings	Listed common stocks, government and corporate debt and annuities.

¹⁷ This table presents the pension asset composition disclosures in the 1992 annual reports of the indicated companies. The sample consists of firms that were selected by the Association for Investment Management and Research (AIMR) for their excellence in corporate reporting. Four firms that do not have a defined benefit pension plan were excluded.

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Implications of the Integral Approach to Quarterly Reporting for the Post-Earnings-Announcement Drift

Srinivasan Rangan
University of California, Davis
Richard G. Sloan
University of Michigan

ABSTRACT: We provide evidence that the auto-regressive structure of seasonally differenced quarterly earnings is consistent with the requirements of the integral approach to Interim reporting. In particular, we show that the auto-regressive coefficients for standardized seasonally differenced quarterly earnings are larger when the quarters employed in the auto-regressions belong to the same fiscal year than when they belong to different fiscal years. We then show that the signs and magnitudes of abnormal stock returns following earnings announcements are systematically related to these differences in the auto-regressive structure of seasonally differenced quarterly earnings. Specifically, stock returns act as if investors underestimate the larger auto-regressive coefficients between quarters in the same fiscal year. Thus, we corroborate and extend the Bernard and Thomas (1990) hypothesis that stock prices fail to reflect the extent to which quarterly earnings series differ from a seasonal random walk.

Key Words: *Integral approach to reporting, Earnings' time-series properties, Post-earnings-announcement drift, Market efficiency.*

Data Availability: *Data are available from sources indicated in the text.*

I. INTRODUCTION

A large body of research documents that past realizations of seasonally differenced quarterly earnings predict subsequent stock returns. Bernard and Thomas (1990) (hereafter BT), hypothesize that this predictability in returns arises because

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investors tend to naively anchor on a seasonal random walk model when forming expectations for quarterly earnings. In support of their hypothesis, BT present evidence that the timing and magnitude of the predictable stock returns are consistent with investors underestimating the average auto-regressive structure of seasonally differenced quarterly earnings. In this paper, we present evidence on a previously undocumented feature of the auto-regressive structure of quarterly earnings. We then show that the earnings expectations embedded in stock prices *not only* underestimate the average auto-regressive coefficients in seasonally differenced quarterly earnings *but also* fail to incorporate the additional feature of the auto-regressive structure that we identify. Hence, our findings corroborate and extend the naive expectation hypothesis proposed by BT.

Our empirical tests exploit the fact that the integral approach to interim reporting influences the auto-regressive structure of seasonally differenced quarterly earnings. The integral approach, mandated in APB Opinion No. 28 (APB 1973), requires certain components of earnings to be smoothed across quarters in the same fiscal year, but does not allow for similar smoothing across quarters in different fiscal years.¹ Consistent with these requirements, we show that the magnitude of the auto-regressive coefficients for seasonally differenced quarterly earnings depends on whether the quarters employed in the auto-regressions belong to the same fiscal year or to different fiscal years. Specifically, we show that the positive auto-regressive coefficients at each of the first three lags are substantially larger when the quarters employed in the auto-regressions belong to the same fiscal year than when they belong to different fiscal years. We then show that the magnitude of the predictable stock returns associated with seasonally differenced quarterly earnings mirror these differences in the auto-regressive structure. Following BT, we illustrate the economic significance of our results by constructing hedge portfolios based on past realizations of forecast errors from a seasonal random walk quarterly earnings model. The hedge portfolios take a long position in firms with the largest positive forecast errors and a short position in firms with the largest negative forecast errors. The hedge portfolio abnormal return over the three quarters following the announcement of earnings for *first* fiscal quarter, which is where deviations from the seasonal random walk model are the strongest, is 13.04 percent. However, the corresponding return over the three quarters following the announcement of earnings for the *fourth* fiscal quarter, which is where deviations from the seasonal random walk model are the weakest, is only 6.66 percent.

Our research increases the credibility of BT's naive expectations hypothesis for understanding and explaining the behavior of stock returns following earnings announcements. Ball and Bartov (1996) question the credibility of the naive expectation hypothesis. They show that the earnings expectations implied by stock prices shortly before earnings announcements are consistent with investors underestimating, but not completely ignoring, dependencies in seasonally differenced quarterly earnings. Based on this evidence, they argue that predictable stock returns following earnings announcements remain anomalous and may be due to biases in sample selection or abnormal return measurement. We show that while the integral approach causes the auto-regressive coefficients of quarterly earnings to vary in a systematic manner, the stock market appears to ignore such variation. Sample selection or risk-based explanations for our findings seem implausible, because they do not explain why the predictable stock returns are larger within fiscal years than across fiscal years. We therefore conclude that BT's naive expectation hypothesis provides a useful

¹ Paragraph 9 of APB No. 28 states that, "the Board has concluded that each interim period should be viewed primarily as an integral part of an annual period." We discuss the specific requirements of APB No. 28 in section II of this paper.

framework for understanding and explaining the predictability of stock returns following earnings announcements.

II. EMPIRICAL PREDICTIONS

The time-series properties of quarterly earnings have been extensively researched using Box-Jenkins techniques (see Foster (1986) for a review). The cumulative evidence reveals two stylized facts concerning the auto-regressive structure of seasonally differenced quarterly earnings. First, the auto-regressive coefficients are positive for the first three lags and exhibit exponential decay over these lags. Second, the auto-regressive coefficient at the fourth lag is negative. These stylized facts form the basis for the tests of the naive expectation hypothesis that are conducted in BT. Recent research has attempted to exploit cross-sectional differences in the time-series properties of earnings to generate more powerful tests of BT's hypothesis (Brown and Han 1997; Bae et al. 1997). Both papers find that the drift tends to persist regardless of differences in the auto-regressive structure of earnings. However, the power of the tests provided in these papers is limited due to the difficulty in accurately identifying cross-sectional differences in the auto-regressive structure of earnings.

Our tests exploit differences in the auto-regressive structure of quarterly earnings that arise from the interim reporting requirements mandated in APB Opinion No. 28. An analysis of these requirements indicates that they have important implications for the time-series properties of quarterly earnings.² We rely on these requirements to generate predictions concerning the time-series properties of quarterly earnings, and then show that these predictions are supported in empirical tests. These robust empirical regularities provide the basis for more powerful tests of BT's naive expectations hypothesis.

Integral Approach to Quarterly Reporting

Our empirical predictions are based on the GAAP requirement that each quarterly reporting period be viewed as an integral part of the annual reporting period.³ The interim reporting requirements governing the preparation of quarterly earnings are set forth in APB Opinion No. 28 (APB 1973), SFAS No. 3 (FASB 1974) and FASB Interpretation No. 18 (FASB 1977). In essence, these standards require firms to estimate many annual operating expenses and then allocate these estimates to interim periods based on forecasted annual figures, such as sales. As the fiscal year progresses, estimates are revised, and estimation errors from earlier quarters are incorporated in earnings as they are realized.

Expenses that are commonly estimated during the first three fiscal quarters include cost of goods sold, income tax expense, and many operating expenses. For example, merchandising firms are permitted to use the gross profit method to estimate cost of goods sold for interim fiscal quarters. Under this method, an estimated gross profit margin is applied to reported quarterly sales to determine quarterly cost of goods sold in the first three fiscal quarters. However, physical inventory levels are counted and audited to determine annual cost of goods sold to prepare year-end financial statements. An illustration of the use of

² Previous research provides evidence suggesting that the time-series properties of quarterly earnings are influenced by interim reporting requirements. Bathke and Lorek (1984) find that the forecast errors generated by conventional time-series models of quarterly earnings are larger in the fourth fiscal quarter. Collins et al. (1984) confirm this result and document a tendency for the forecast errors to increase in magnitude as the fiscal year progresses. Mendenhall and Nichols (1988) and Salamon and Stober (1994) show that forecast errors in the fourth fiscal quarter have the smallest impact on stock prices, indicating that fourth quarter earnings are less value-relevant.

³ In contrast to the integral approach, the discrete approach to quarterly reporting treats each quarterly period as a separate reporting period, applying the same rules to adjacent quarters as are applicable to adjacent fiscal years.

the gross profit method is contained in Note 9 to the 1990 financial statements of Lancer Corporation:

The company uses the gross profit method to determine the cost of sales and estimates the inventory components for interim periods after considering various factors including historical percentages and price increases. During the first three quarters of 1990 and 1989, the gross profit margin utilized was approximately 20% and 23%, respectively. The fourth quarter of 1989 includes a cumulative inventory adjustment of \$3,333,499 reflecting the actual gross profit margin for the year.

Taxes provide a second example of interim expense allocation. Firms calculate quarterly tax expense by estimating the effective tax rate for the full fiscal year and applying this rate to quarterly earnings. In each quarter, the estimated effective tax rate is updated and the tax expense for the quarter is obtained by summing: (1) the tax expense obtained by applying the updated estimated tax rate to earnings for the quarter; and (2) the cumulative error from using outdated rate estimates in prior quarters. This procedure is illustrated in Note 16 of Compaq Computer Corporation's 1991 financial statements:

During the first six months of 1991 the Company estimated that its effective tax rate would be 34%. During the third quarter of 1991, the Company incurred a \$135 million restructuring charge, which substantially reduced the forecast of 1991 pre-tax earnings. Consequently, the Company revised its estimated effective tax rate downward to 28%. The actual effective tax rate for 1991 was 27.9%. The full benefit of the lower rate was recorded in the third quarter of 1991 and had the effect of reducing the loss per share for the quarter by approximately \$0.13.

As a final example, firms may estimate annual operating expenses and then allocate these expenses across quarters in the fiscal year. This procedure is illustrated in Note 18 to Trans World Airlines 1990 financial statements:

Certain aircraft related operating costs, principally flight equipment depreciation and amortization, including aircraft held under capital leases and flight equipment maintenance expense—for annual purposes, are included in the results of operations either on a straight line or period basis. For interim accounting periods within each year, however, such aircraft related operating costs—as projected and as finally determined for each annual reporting period—are charged to the interim accounting periods of each year on the basis of projected aircraft usage (hours flown) during each month and quarter of each year.

The preceding description of the integral method has implications for the time-series properties of quarterly earnings. Many expense allocations for quarters within the same fiscal year are based on common annual estimates of the allocation base. In contrast, expense allocations for quarters in adjacent fiscal years are based on estimates of the allocation base that may be substantially different. Consequently, the application of the integral method should produce intra-year dependencies in quarterly earnings that are stronger than inter-year dependencies.

Implications for Earnings and Stock Returns

The preceding discussion allows us to develop predictions about the auto-regressive properties of quarterly earnings. We begin by defining standardized unexpected earnings (SUE) in a manner similar to BT and Ball and Bartov (1996). SUE_t is defined as the standardized forecast error for quarter t from a seasonal random walk model of quarterly

earnings. Specifically, we deflate seasonally differenced earnings for quarter t by the market value of equity at the end of that quarter and then replace the resulting variable by its decile ranking for the quarter. The use of decile rankings follows past research in this area, and we describe the procedure employed to create these rankings in more detail at the beginning of section III. Next, we estimate the auto-regressive coefficients of SUE at each lag k ($k = 1, 2$ and 3) by running the following pooled univariate regression:⁴

$$\text{SUE}_t = a_k + b_k \text{SUE}_{t-k} + \epsilon_t; \quad k = 1, 2, 3. \quad (1)$$

Ball and Bartov (1996) estimate the above regression for the sample of firm-quarters used in BT, and show that b_1 , b_2 and b_3 are positive. Our discussion of the integral method implies that SUE in quarter $t-k$ is more likely to persist into quarter t , if quarters t and $t-k$ are in the same fiscal year than if they belong to different fiscal years.⁵ Therefore, we predict that b_k will be more positive when quarters t and $t-k$ are in the same fiscal year. We can test this prediction by extending equation (1) to include an indicator variable:

$$\text{SUE}_t = a_k + b_k \text{SUE}_{t-k} + c_k \text{DUM}_k + d_k (\text{SUE}_{t-k} * \text{DUM}_k) + \epsilon_t; \quad k = 1, 2, 3. \quad (2)$$

The indicator variable, DUM_k equals one if quarters t and $t-k$ are in the same fiscal year and zero otherwise. If SUE_t is measured in the first fiscal quarter, then, with $k = 1$, DUM_k will equal zero because SUE_{t-k} is measured in the fourth quarter of the previous fiscal year. However, if SUE_t is measured in the second, third or fourth fiscal quarters, then, with $k = 1$, DUM_k will equal one because SUE_{t-k} is measured in the same fiscal year. We include DUM_k as both a main effect and as an interaction with SUE_{t-k} . The main effect allows for the possibility that the mean of SUE_t may vary across fiscal quarters. While we do not have an *a priori* reason for such a prediction, the incorrect exclusion of the main effect would lead to a correlated omitted variables bias on the interactive term. The interactive term captures the effect of the integral method on the autocorrelation structure of SUE. In equation (2), b_k is the auto-regressive coefficient at lag k for quarters in *different* fiscal years, while d_k measures the incremental magnitude of the auto-regressive coefficient at lag k for quarters in the *same* fiscal year. The prediction that b_k in equation (1) will be more positive when quarters t and $t-k$ are in the same fiscal year can now be stated as:

P1: For $k = 1, 2$ and 3 , d_k is positive.

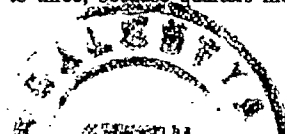
We develop our stock price predictions using a framework similar to that in Abarbanell and Bernard (1992). Assuming that the price response to unexpected earnings is linear gives:

$$\text{CAR}_t = \alpha_0 + \beta \epsilon_t^* + \omega_t. \quad (3)$$

The dependent variable, CAR_t , measures the cumulative abnormal stock return around the announcement of SUE_t , ϵ_t^* represents the market's assessment of unexpected SUE, and β is the familiar earnings response coefficient ($\beta > 0$). Substituting the unexpected SUE implied by the model in equation (1) for the ϵ_t^* term in equation (3) gives:

⁴ To ease exposition, we ignore firm-specific subscripts throughout the paper.

⁵ In testing this prediction, we only consider values of k from one to three, because quarters more than three periods apart are always in different fiscal years.



$$CAR_t = (\alpha_0 - \beta a_k^*) + \beta SUE_t - \beta b_k^* SUE_{t-k} + \omega_t. \quad (4)$$

The coefficient b_k^* represents the stock market's estimate of the auto-regressive coefficient on SUE_{t-k} . If stock prices rationally anticipate the implications of past SUEs for future SUEs, then $b_1^* = b_1$, $b_2^* = b_2$, and $b_3^* = b_3$. These conditions imply that CAR_t responds to ϵ_t , and that information in SUE_{t-1} , SUE_{t-2} , or SUE_{t-3} cannot be used to predict CAR_t .

BT hypothesize that investors tend to anchor on a seasonal random walk earnings expectation. Their hypothesis implies that the market's expectations of the auto-regressive coefficients will be biased toward zero. Specifically, given that $b_1, b_2, b_3 > 0$ in equation (1), the BT hypothesis predicts that $b_1^* < b_1$, $b_2^* < b_2$, and $b_3^* < b_3$. In equation (2), we provide a more detailed description of the auto-regressive properties of SUE based on the implications of the integral method. If equation (2) is empirically descriptive, we can make additional predictions about earnings expectations embedded in stock prices. Combining equations (2) and (3) gives:

$$CAR_t = (\alpha_0 - \beta a_k^*) + \beta SUE_t - \beta b_k^* SUE_{t-k} - \beta c_k^* DUM_k \\ - \beta d_k^* (SUE_{t-k} * DUM_k) + \omega_t \quad (5)$$

If stock prices rationally anticipate the implications of the integral approach, then d_k^* will equal d_k . However, if investors tend to anchor on a seasonal random walk earnings expectation and ignore the implications of the integral approach, then we predict that:

P2: For $k = 1, 2$ and 3 , $d_k^* < d_k$

Intuitively, P2 predicts that if investors tend to anchor on a seasonal random walk earnings expectation, then their earnings expectations should underestimate the larger auto-regressive coefficients of SUEs belonging to the same fiscal year.

III. EMPIRICAL RESULTS

Tests of the Time-Series Properties of Quarterly Earnings

We conduct our empirical analysis with firm-quarters in the intersection of the current and historical quarterly Compustat files and the CRSP daily stock return files. To be included in our sample, a firm-quarter is required to have non-missing data on earnings, market value of equity at the end of the quarter, stock returns, and the earnings announcement date. We define earnings as income before extraordinary items (Quarterly Compustat data item 8). Market value of equity is computed as the product of price per share at the end of the quarter (Quarterly Compustat data item 14) and common shares outstanding (Quarterly Compustat data item 61). We limit our analysis to firm-quarters in the years 1971–1994 because Compustat began collecting earnings announcement dates only in 1971. Our final sample consists of 172,564 firm-quarters.

To compute SUE, we first deflate seasonally differenced quarterly earnings by the market value of equity at the end of the quarter. Next, we follow BT and Ball and Bartov (1996) and transform SUE into decile rankings. The decile rankings are scaled to have a range of one and a mean of zero. This is accomplished by dividing rankings that initially range from zero to nine by nine and then subtracting 0.5.⁶ Decile cutoffs are established

⁶ The use of decile rankings limits the influence of outlying observations on the results. Scaling the rankings to have a range of one allows the regression coefficients in the stock return regressions to be interpreted as hedge portfolio returns (see Bernard and Thomas 1990, 325–326). Centering the rankings on zero has no effect on any of the results of interest, but is convenient because it sets the expected values of the intercepts in the auto-regressions to zero.

for each quarter using the empirical distribution of SUEs from the corresponding quarter in the previous fiscal year in order to avoid hindsight bias in portfolio construction. We follow Compustat conventions to define fiscal years and quarters.

Panel A of table 1 presents auto-regressive coefficients for lags 1 through 4. The reported values for each lag k are coefficient estimates obtained from pooled regressions of SUE at quarter t on SUE at quarter $t-k$. Consistent with previous research, we find that the coefficients at lags 1 through 3 are positive and exhibit exponential decay; the coefficient at lag 4 is negative. Panel B of table 1 reports auto-regressive coefficients estimated separately for each fiscal quarter. For example, the auto-regressive coefficient at lag 1 for the first fiscal quarter is the coefficient from a regression of SUE at the first fiscal quarter on SUE at the fourth fiscal quarter of the preceding fiscal year. The stepped line in panel B separates auto-regressive coefficients estimated using quarters in the same fiscal year (below the line) from those estimated using quarters in different fiscal years (above the line). At each of lags 1, 2 and 3, the auto-regressive coefficients for quarters in the same fiscal year are larger than the auto-regressive coefficients for quarters in different fiscal years. For example, at lag 1, the auto-regressive coefficient between the first quarter SUE and the preceding fiscal year's fourth quarter SUE is 0.30. In contrast, the three within-year auto-regressive coefficients at lag 1 range from 0.42 to 0.48. Hence, the evidence in table 1 indicates that the auto-regressive coefficients at lags 1, 2 and 3 behave in a manner consistent with the implications of the integral requirements for interim reporting.

TABLE 1
Auto-Regressive Coefficients for Seasonally Differenced Quarterly Earnings

In panel A, we report coefficient estimates from the following pooled univariate regressions for our sample of 172,564 firm-quarters from the 1971–1994 period:

$$SUE_t = a_k + b_k SUE_{t-k} + \epsilon_t; \quad k = 1, 2, 3 \text{ and } 4$$

In panel B, we report coefficient estimates from the above regression stratified by fiscal quarter. To compute SUE, we first deflate seasonally differenced quarterly earnings by the market value of equity at the end of the fiscal quarter. We then transform the resulting variable into decile rankings and scale it such that it has a range of one and a mean of zero (so it is numbered from -0.5 to 0.5). Decile cut-offs are defined for every quarter using the distribution of actual SUEs in same quarter of the previous year in order to avoid hindsight bias in portfolio construction. We define earnings as income before extraordinary items (Quarterly Compustat data item 8). Market value of equity is computed as the product of price per share at the end of the quarter (Quarterly Compustat data item 14) and common shares outstanding (Quarterly Compustat data item 61).

	<u>$k = 1$</u>	<u>$k = 2$</u>	<u>$k = 3$</u>	<u>$k = 4$</u>
<i>Panel A: Auto-Regressive Coefficients Computed for All Fiscal Quarters</i>				
All fiscal quarters	0.40	0.23	0.09	−0.17
<i>Panel B: Auto-Regressive Coefficients Computed Separately for Each Fiscal Quarter</i>				
First fiscal quarter	0.30	0.22	0.09	−0.13
Second fiscal quarter	0.48	0.18	0.09	−0.16
Third fiscal quarter	0.44	0.28	0.05	−0.17
Fourth fiscal quarter	0.42	0.26	0.11	−0.20

The final column in panel B indicates that the auto-regressive coefficients at lag 4 are negative for all four fiscal quarters. In addition, these coefficients become progressively more negative as the fiscal year progresses. For example, the auto-regressive coefficient for the fourth fiscal quarter (-0.20) is over 50 percent more negative than the auto-regressive coefficient for the first fiscal quarter (-0.13). Recall that the application of the integral requirements for interim reporting results in estimation errors that are realized over the course of the fiscal year. The increasing frequency of estimation errors as the year progresses provides a possible explanation for the increasing negative trend in these coefficients.⁷

In table 2, we report the results of formal statistical tests of the implications of the integral method for the time-series properties of quarterly earnings. The table presents estimates of equation (2), where we regress SUE_t on SUE_{t-k} ($k = 1, 2, 3$) and an interactive indicator variable (DUM_k) to capture fiscal year dependencies. The coefficient on SUE_{t-k} , b_k , represents the auto-regressive coefficient for the SUEs of quarters positioned in different fiscal years. The coefficient on $SUE_{t-k} * DUM_k$, d_k , represents the incremental magnitude of the coefficient for the SUEs of quarters positioned in the same fiscal year. The a_k term

⁷ To see how estimation errors could induce negative auto-regressive coefficients at the fourth lag, consider a negative estimation error in the fourth quarter of the current year (quarter t). Such an error will result in a lower SUE in quarter t and a higher SUE in quarter $t+4$ (because quarter t earnings is subtracted in the computation of SUE for quarter $t+4$). By inducing opposite effects on SUEs four quarters apart, the estimation errors will induce negative auto-regressive coefficients at the fourth lag.

TABLE 2
Tests of the Implications of the Integral Method of Reporting for the Time-Series Properties of Seasonally Differenced Quarterly Earnings

The table reports coefficient estimates from the following regression for our sample of firm-quarters from the 1971–1994 period:

$$SUE_t = a_k + b_k SUE_{t-k} + c_k DUM_k + d_k (SUE_{t-k} * DUM_k) + \epsilon_t, \quad k = 1, 2, 3$$

SUE is defined in table 1. DUM_k equals one when quarter t and quarter $t-k$ are from the same fiscal year and zero otherwise. Figures in parentheses are t -statistics.

<i>Coefficient Estimate</i>	<i>k = 1</i>	<i>k = 2</i>	<i>k = 3</i>
a_k	-0.01 (-1.69)	0.00 (1.32)	0.00 (2.61)
b_k	0.30 (72.15)	0.20 (61.47)	0.08 (27.65)
c_k	0.01 (4.92)	0.01 (4.46)	0.01 (4.83)
d_k	0.15 (30.79)	0.07 (14.34)	0.04 (6.40)
Adjusted R^2	0.163	0.052	0.007
No. of observations	165,857	164,556	162,084

measures the intercept for quarters in different fiscal years, while the sum of the a_k and c_k terms measures the intercept for quarters in the same fiscal year.⁸

Our first empirical prediction is that d_k is positive, which implies that the positive auto-regressive coefficient between SUEs at lags 1, 2 and 3 is higher for quarters in the same fiscal year. When $k = 1$, $b_k = 0.30$ ($t = 72.15$), indicating that the auto-regressive coefficient at lag 1 is positive for quarters in different fiscal years. Consistent with the predicted consequences of the integral method, the coefficient on d_1 is positive and statistically significant at the one percent level (t -statistic = 30.79). The coefficient estimate equals 0.15, implying that the first-order auto-regressive coefficient between SUEs in the same fiscal year is 0.45, which is 50 percent larger than for SUEs in different fiscal years.

Consistent with previous research, the auto-regressive coefficients at lags 2 and 3 gradually decline in magnitude. Additionally, consistent with the predicted consequences of the integral method, the d_k coefficients are positive. At the second lag, b_2 is 0.20 ($t = 61.47$) and d_2 is 0.07 ($t = 14.34$), implying a second-order auto-regressive coefficient of 0.20 between SUEs in different fiscal years and of 0.27 between SUEs in the same fiscal year. At the third lag, b_3 is 0.08 ($t = 27.65$) and d_3 is 0.04 ($t = 6.40$). This implies a third-order auto-regressive coefficient of 0.08 between SUEs in different fiscal years and of 0.12 between SUEs in the same fiscal year. Overall, the results are consistent with our first prediction—the auto-regressive coefficients are significantly larger when the SUEs used in the regression belong to the same fiscal year.

In table 3, we report results of a robustness check on the results in table 2. Because most firms have December fiscal year ends, it is possible that our results are due to dependencies associated with the calendar year rather than the integral method of reporting. For example, because taxes are levied on a calendar-year basis, annual changes in tax regulations could introduce calendar-year dependencies in earnings. To investigate this possibility, table 3 repeats the analysis in table 2 after stratifying the sample into firms with December and non-December fiscal year ends. If calendar-year effects drive the SUE dependencies, then the d_k s should be larger for December fiscal year-end firms. On the other hand, if the integral reporting requirements induce the SUE dependencies, then the d_k s should be similar for the two sets of firms.

Panel A of table 3 provides results for firms with December fiscal year-ends, while panel B provides results for firms with non-December fiscal year-ends. Panel C provides results for a Chow (1960) test for the stability of the d_k coefficients across the two samples. Because the intercept terms are all close to zero and similar across the two samples, we omit them for brevity. The results indicate that the auto-regressive coefficients are very similar across the two samples. In particular, there is no evidence that the d_k coefficients are smaller for non-December fiscal year-end firms. While d_k is slightly larger for the non-December sample at lags 1 and 3, it is identical for the two samples at lag 2. Further, the Chow (1960) tests for structural stability reject at the five percent level only at lag 3. However, the direction of the rejection is opposite to that predicted by the explanation based on calendar-year dependencies. Therefore, the results in table 3 provide corroborative evidence that the stronger auto-regressive coefficients for SUEs belonging to the same fiscal year are attributable to the requirements of the integral method of reporting.

⁸ The intercept terms are all close to zero. Recall that the SUE rankings are scaled to have an expected value of zero. However, because the SUE rankings are assigned based on the empirical distribution of SUEs in the previous calendar year, intertemporal changes in the SUE distribution will lead to non-zero intercepts. That the intercept terms are all close to zero, suggests that the annual SUE distributions are reasonably stable over the sample period.

TABLE 3

Tests of the Implications of the Integral Method of Reporting for the Time-Series Properties of Seasonally Differenced Quarterly Earnings: Stratification by December vs. Non-December Fiscal Year-Ends

We stratify our final sample of firm-quarters into observations with December fiscal year-ends and non-December fiscal year-ends. The following regression is then estimated for each of the two sub-samples:

$$SUE_t = a_k + b_k SUE_{t-k} + c_k DUM_k + d_k (SUE_{t-k} * DUM_k) + \epsilon_t; \quad k = 1, 2, 3$$

SUE and DUM are defined in table 1 and table 2, respectively. Panel A contains the results for the December year-end firms and panel B contains the results for the non-December year-end firms. Figures in parentheses are t-statistics. Panel C reports the results of Chow tests for equality of regression coefficients across the two sub-samples.

<i>Coefficient Estimate</i>	<i>k = 1</i>	<i>k = 2</i>	<i>k = 3</i>
<i>Panel A: December Fiscal Year-End Firms</i>			
b_k	0.30 (54.75)	0.21 (47.32)	0.09 (27.65)
d_k	0.13 (20.39)	0.05 (7.28)	0.01 (0.98)
Adjusted R^2	0.154	0.053	0.007
No. of observations	96,928	96,168	94,800
<i>Panel B: Non-December Fiscal Year-End Firms</i>			
b_k	0.30 (43.77)	0.20 (37.09)	0.07 (14.47)
d_k	0.16 (19.46)	0.05 (6.21)	0.04 (4.69)
Adjusted R^2	0.176	0.050	0.007
No. of observations	68,928	68,387	67,283
<i>Panel C: Test for Stability of d_k Between December and Non-December Year Ends</i>			
F-value	0.57	0.25	10.25
Two-sided p-value	0.45	0.62	0.00

Tests of Predictability of Stock Returns

The previous section demonstrates that the integral reporting requirements influence the time-series properties of earnings. In this section, we test whether stock prices incorporate these influences. Following BT, we begin by examining quarter t stock returns to hedge portfolios that are formed based on SUE deciles for quarter $t-k$ (where $k = 1, 2$ and 3). The hedge portfolio associated with SUE for quarter $t-k$ consists of an equally weighted long position in stocks in the highest SUE_{t-k} decile and an offsetting equally weighted short position in the stocks in the lowest SUE_{t-k} decile. We define the hedge portfolio abnormal

return as the difference between the mean abnormal returns of the top and bottom SUE_{t-k} deciles.

We examine hedge portfolio abnormal returns over two measurement intervals. First, consistent with BT, we use a three-day window that begins two days before the announcement of quarter t 's earnings and ends on the day of the announcement. Second, we use a quarter-long window that begins two days following the announcement of quarter $t-1$'s earnings and ends on the day of quarter t 's earnings announcement.⁹ This longer measurement interval allows us to capture the well-documented fact that other information sources (e.g., management earnings forecasts) cause stock prices to reflect quarter t earnings before the earnings announcement for that quarter.¹⁰ Stock returns are measured as buy-and-hold, with-dividend returns compounded over each of the two return windows and abnormal stock returns are computed by subtracting the return on the CRSP value-weighted index over the corresponding window. Because Bernard and Thomas (1989) show that the predictable stock returns associated with past realizations of seasonally differenced quarterly earnings are robust with respect to a variety of risk adjustment techniques, we restrict our analysis to market-adjusted returns.

Table 4 reports the hedge portfolio abnormal returns. In panel A, we replicate BT's results for our sample. In the first row of panel A, we report the three-day announcement period hedge portfolio abnormal returns. Consistent with BT's results, the hedge portfolio abnormal return is positive for $k = 1, 2$ and 3 and negative for $k = 4$. As argued by BT, this pattern suggests that investors tend to anchor on a seasonal random walk earnings expectation. The second row of panel A reports the hedge portfolio abnormal return from the day after quarter $t-1$'s earnings announcement through quarter t 's announcement. Again, the hedge portfolio abnormal return is positive for $k = 1, 2$ and 3 and negative for $k = 4$, consistent with the hypothesis that investors tend to anchor on a seasonal random walk earnings expectation. The cumulative three-quarter hedge portfolio abnormal return is $(1.0668) \times (1.0228) \times (1.0060) - 1 = 0.0977$, or 9.77 percent, which is comparable to the 8.10 percent reported by BT.

In panel B, we report the hedge portfolio abnormal return for the same holding periods as panel A, but partition the results by fiscal quarter. If investors tend to anchor on a seasonal random walk earnings expectation and ignore the implications of the integral method, then the pattern in hedge portfolio abnormal returns should correspond to that of the auto-regressive coefficients in SUEs reported in table 1. In particular, for $k = 1, 2$ and 3 , the hedge portfolio abnormal returns should be larger for quarters in the same fiscal year (below the stepped line) than for quarters in different fiscal years (above the stepped line). The results are broadly consistent with this prediction.¹¹ For example, when $k = 1$, the hedge portfolio abnormal return for the first fiscal quarter (for which portfolios are formed based on SUEs in the fourth fiscal quarter of the prior fiscal year) is only 0.15 percent over the three-day holding period and 3.09 percent over the one-quarter holding period. In contrast, the abnormal return to the hedge portfolios held during the second, third and fourth

⁹ For the quarter-long return measurement interval, we wait until two days after quarter $t-1$'s announcement date to begin cumulating returns. This procedure ensures that we do not capture the contemporaneous response to the announcement of earnings for quarter $t-1$ as it may occur after the close of the market on the announcement date.

¹⁰ Consistent with the anticipation of earnings from other sources, Lys and Soffer (1997) show that although information in SUE_{t-1} about SUE_t is largely unanticipated on the day after quarter $t-1$'s earnings announcement, about half of that information is anticipated immediately prior to quarter t 's earnings announcement.

¹¹ The only exception is for the one-quarter return measurement interval when $k = 3$. However, this result is expected to be weak, because the auto-regressive SUE coefficient is close to zero for $k = 3$.

TABLE 4
Abnormal Stock Returns Around Earnings Announcements for Quarter t for Hedge Portfolios Formed Based on Standardized Unexpected Earnings for Quarters $t-k$ ($k=1, 2, 3$ and 4)

The table reports the abnormal stock returns around the announcement of earnings for quarter t for hedge portfolios formed based on SUEs from quarters $t-k$ ($k=1, 2, 3$ and 4). SUEs are decile rankings of the standardized seasonal difference in quarterly earnings and are defined in table 1. The hedge portfolio formed on SUE for period $t-k$ consists of an equally weighted long position in the stocks in the highest SUE $_{t-k}$ decile and an offsetting equally weighted short position in the stocks in the lowest SUE $_{t-k}$ decile. Each cell reports hedge portfolio abnormal returns over two holding periods in quarter t : (1) a three-day window beginning two days before the announcement of quarter t 's earnings and ending on the announcement day and (2) a quarter-long measurement interval beginning two days following the announcement of quarter $t-1$'s earnings and ending on the day of quarter t 's earnings announcement. Stock returns for each holding period are computed as buy-and-hold, with-dividend returns and abnormal returns are computed by subtracting the return on the CRSP value-weighted index over the corresponding holding period. In panel A, we report the hedge portfolio abnormal returns without regard to the fiscal quarter in which SUE is measured. Panel B reports hedge portfolio abnormal returns for each fiscal quarter. In panel B, the numbers below (above) the stepped line are returns to hedge portfolios formed based on SUEs in the same (different) fiscal year(s). Figures in parentheses are t -statistics testing the null hypothesis that the hedge portfolio abnormal return equals zero.

	<u>$k = 1$</u>	<u>$k = 2$</u>	<u>$k = 3$</u>	<u>$k = 4$</u>
<i>Panel A: Hedge Portfolio Abnormal Return for All Fiscal Quarters (%)</i>				
Earnings announcement return	1.48 (10.15)	1.05 (7.24)	0.01 (0.19)	-1.00 (-6.83)
One-quarter return	6.68 (17.19)	2.28 (5.86)	0.60 (1.52)	-1.26 (-3.09)
<i>Panel B: Hedge Portfolio Abnormal Return for Each Fiscal Quarter (%)</i>				
First fiscal quarter				
Earnings announcement return	0.15 (0.65)	0.46 (1.60)	-0.57 (-1.89)	-1.14 (-3.37)
One-quarter return	3.09 (6.07)	0.19 (0.30)	-1.05 (-1.67)	-2.15 (-3.42)
Second fiscal quarter				
Earnings announcement return	2.19 (6.97)	0.25 (1.10)	0.09 (0.33)	-0.80 (-2.69)
One-quarter return	8.79 (11.25)	1.71 (2.99)	0.62 (0.85)	-0.16 (-0.22)
Third fiscal quarter				
Earnings announcement return	2.50 (7.28)	2.10 (5.65)	0.08 (0.32)	-1.36 (-3.86)
One-quarter return	7.41 (9.40)	3.48 (4.12)	1.72 (2.90)	0.15 (0.20)
Fourth fiscal quarter				
Earnings announcement return	1.92 (6.24)	1.99 (6.32)	0.23 (0.69)	-0.85 (-3.62)
One-quarter return	9.58 (8.93)	4.24 (3.80)	0.41 (0.33)	-1.80 (-2.11)

fiscal quarters range from 1.92 percent to 2.50 percent over the three-day holding periods and from 7.41 percent to 9.58 percent over the one-quarter holding periods,¹² respectively. Overall, these results are consistent with our prediction that investors do not anticipate the stronger auto-regressive coefficients between SUEs in the same fiscal year.

The economic significance of the above results for the magnitude of the post-earnings-announcement-drift can be gauged by cumulating the hedge portfolio abnormal return over multiple quarters. The temporal dependencies in SUE resulting from the interim reporting requirements are the greatest following SUE innovations in the first fiscal quarter, because the integral approach provides for smoothing of these shocks across the following three quarters. Cumulating the hedge portfolio abnormal return over the three quarters, following the first fiscal quarter, yields an average return of $(1.0879) \times (1.0348) \times (1.0041) - 1 = 0.1304$, or 13.04 percent. The temporal dependencies resulting from the interim reporting requirements have no effect following earnings shocks in the fourth fiscal quarter. Cumulating the hedge portfolio abnormal return over the three quarters following fourth fiscal quarter yields an average return of only $(1.0309) \times (1.0171) \times (1.0172) - 1 = 0.0666$, or 6.66 percent.

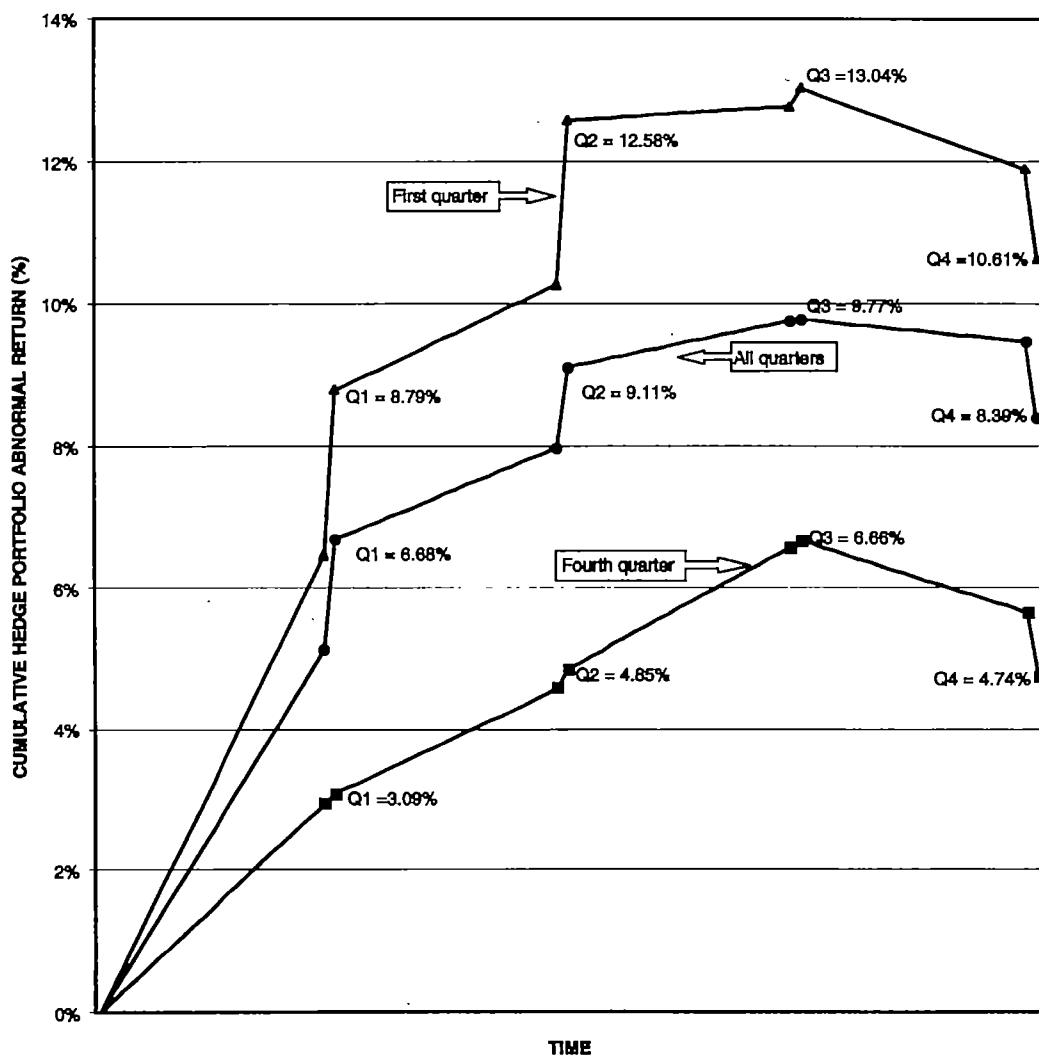
Figure 1 illustrates the differences in the magnitude of the post-earnings-announcement drift following different fiscal quarters. The figure plots the cumulative four-quarter hedge portfolio abnormal return following the first and fourth fiscal quarters, along with the cumulative hedge portfolio abnormal return following all quarters (the BT strategy). The graph is constructed by cumulating the hedge portfolio abnormal returns reported in table 4. For example, the return following the first fiscal quarter is obtained by cumulating the hedge portfolio return for the second fiscal quarter with $k = 1$, the third fiscal quarter with $k = 2$, and the fourth fiscal quarter with $k = 3$.¹² The cumulative hedge portfolio abnormal return associated with original BT strategy lies in the middle of the graph and is obtained by plotting the numbers reported in panel A of table 4. The cumulative hedge portfolio abnormal return following the first fiscal quarter, which lies at the top of the graph, clearly dominates the returns to the BT strategy. Further, the cumulative hedge portfolio abnormal return following the fourth fiscal quarter is the lowest of the three strategies. The post-earnings-announcement drift following the first fiscal quarter is approximately twice that following the fourth fiscal quarter. The figure clearly illustrates that exploiting the stronger auto-regressive coefficients between SUEs in the same fiscal year provides greater predictive ability with respect to future stock returns.

The final column of panel B in table 4 reports the hedge portfolio abnormal return resulting from the failure of stock prices to incorporate the negative auto-regressive coefficient for $k = 4$. While the abnormal returns are negative for all four fiscal quarters, there is no apparent pattern in these returns across fiscal quarters. Specifically, there is little evidence that the abnormal returns are more negative in the fourth fiscal quarter. These results are of interest, because the results in table 1 indicate that the negative auto-regressive coefficient for $k = 4$ is most negative for the fourth fiscal quarter. Thus, it appears that

¹² Each plot in figure 1 is constructed using eight segments. For example, for the cumulative hedge portfolio return following the first fiscal quarter, the plot is constructed as follows. The first segment measures the return beginning two days after the announcement of earnings for the first fiscal quarter through three days prior to the announcement of earnings for the second fiscal quarter and equals 6.46 percent. The second segment measures the three-day earnings announcement return for the second fiscal quarter and equals 2.19 percent. The cumulative return, through the end point of the second segment, denoted as Q1, is the cumulative return one quarter after the earnings announcement for the first fiscal quarter (i.e., $1.0646 \times 1.0219 = 0.0879$, or 8.79 percent, as shown in column 2, row 2 of panel B of table 4). The remaining segments for each plot are constructed in a similar manner.

FIGURE 1
Cumulative Hedge Portfolio Abnormal Returns Following (1) All Fiscal Quarters; (2) First
Fiscal Quarters; and (3) Fourth Fiscal Quarters

The figure plots the four-quarter cumulative hedge portfolio abnormal return (CAR) following different fiscal quarters' earnings announcements. The hedge portfolio takes a long position in the highest decile SUE stocks and a corresponding short position in the lowest decile SUE stocks. The top plot is the CAR following first fiscal quarter earnings announcements, the middle plot is the CAR following all earnings announcements, and the bottom plot is the CAR following fourth fiscal quarter earnings announcements. Each plot is divided into eight segments. The first segment measures the return from the second day following the earnings announcement date to the day three days before the following quarter's earnings announcement date. The second segment measures the three day announcement period for the following quarter's earnings. The end point of the second segment is referred to as Q1 and equals the cumulative return through the following quarter's earnings announcement. Similarly, Q2, Q3 and Q4 refer to the CAR through the announcement of earnings for the second, third and fourth quarters following the original earnings announcement. Footnote 12 provides a more detailed description of plot construction.



stock prices incorporate the fact that the auto-regressive coefficient for $k = 4$ is more negative in the fourth fiscal quarter.

Next, we present formal statistical tests of whether stock prices reflect the implications of the integral method of reporting for the time-series properties of earnings. Recall, from section II, that we expect the auto-regressive coefficients of SUE to be characterized by equation (2) and P1. Furthermore, equation (5) captures the estimates of the auto-regressive SUE coefficients implied by stock prices. By jointly estimating equation (2) and equation (5), we can compare the actual auto-regressive coefficients in equation (2) and the implied auto-regressive coefficients in equation (5). Mishkin (1983) develops an appropriate econometric procedure for this task. The procedure estimates the two-equation system simultaneously and uses non-linear least squares, because equation (5) is non-linear in the parameter estimates. Market efficiency implies that the actual and implied auto-regressive coefficients should be equal, and this cross-equation restriction can be tested using a likelihood ratio test. The main advantage of Mishkin's (1983) estimation procedure is that it provides point estimates and standard errors for the implied auto-regressive coefficients. Moreover, the likelihood ratio test for market efficiency is asymptotically equivalent to more traditional tests of market efficiency in which stock returns are regressed on lagged SUE.¹³ The dependent variable in equation (5) is measured over the longer return measurement interval used in table 4 that cumulates returns over the quarter leading up to the announcement of quarter t 's earnings. The longer quarter-long period is chosen over the shorter three-day announcement period because it captures earnings information that is disseminated from other sources (Lys and Soffer 1997).¹⁴

Table 5 reports results from the estimation of equations (2) and (5). The intercept terms (a_k , c_k , a_k^* , c_k^* and α_0) are all close to zero and we omit them from the table for brevity. In panel A, we report the actual auto-regressive coefficient estimates from equation (2), b_k and d_k , along with the corresponding coefficient estimates implied by stock prices, b_k^* and d_k^* . The panel also reports β , which measures the stock price reaction for a one-unit change in the contemporaneous SUE. Recall that SUE is measured as decile rankings that range from -0.5 to 0.5 . Consequently, the β coefficient can be interpreted as an estimate of the contemporaneous abnormal return to a hedge portfolio with a long position in observations in the highest SUE decile and a short position in observations in the lowest SUE decile (see BT, 325–326).

Consistent with BT, we find that $b_k^* < b_k$ for $k = 1, 2$ and 3 . This result indicates that the expectations embedded in stock prices systematically underestimate the positive auto-regressive coefficients in SUE for $k = 1, 2$ and 3 . Consistent with P2, we also find that $d_k^* < d_k$ for $k = 1, 2$ and 3 . This result indicates that the expectations embedded in stock prices systematically underestimate the stronger auto-regressive coefficients between SUEs belonging to the same fiscal year. In short, while the stronger coefficients between SUEs

¹³ Mishkin (1983) provides a very detailed description of the estimation procedure (including a sample SAS program). He also provides a detailed description of the advantages of the simultaneous estimation procedure over two-stage OLS estimation of the forecasting and pricing equations, such as is used by Ball and Bartov (1996). Finally, Mishkin (1983) provides a formal proof of the asymptotic equivalence of the likelihood ratio test for market efficiency used by his procedure and the standard t -test based on a regression of stock returns on the lagged forecasting variables.

¹⁴ We also estimated the system using the three-day announcement return as the dependent variable in the pricing equation. The results were generally consistent with the results obtained in table 5 using the quarter-long measurement interval. However, consistent with the findings in Lys and Soffer (1997), the implied auto-regressive coefficients are generally slightly closer to the actual auto-regressive coefficients when using the shorter three-day announcement returns. Nevertheless, the implied market efficiency constraints, $b_k = b_k^*$ and $d_k = d_k^*$, are both rejected at conventional levels for both $k = 1$ and $k = 2$.

TABLE 5
Tests of Stock Market Efficiency with Respect to the Implications of the Integral Method of Reporting for the Prediction of Future Quarterly Earnings

The table reports coefficient estimates from the simultaneous estimation of the following two equations using the simultaneous non-linear procedure proposed by Mishkin (1983):

$$SUE_t = a_k + b_k SUE_{t-k} + c_k DUM_k + d_k (SUE_{t-k} * DUM_k) + \epsilon_t$$

$$CAR_t = (\alpha_0 - \beta a_k^*) + \beta SUE_t - \beta b_k^* SUE_{t-k} - \beta c_k^* DUM_k - \beta d_k^* (SUE_{t-k} * DUM_k) + \omega_t; \quad k = 1, 2, 3$$

CAR_t is the market adjusted stock return over the period beginning two days after the announcement of earnings for quarter t-1 through the day of the announcement of earnings for quarter t. SUE is the standardized seasonal difference in quarterly earnings and is defined in table 1. The indicator variable, DUM_k, takes on the value of one when quarters t and t-k are in the same fiscal year and zero otherwise. The sample consists of firm-quarters from 1971 to 1994.

Panel A: Unconstrained Model Estimation

<i>Parameter</i>	<i>k = 1</i>	<i>k = 2</i>	<i>k = 3</i>
b_k	0.30**	0.20**	0.08**
b_k^*	0.07**	0.10**	0.04**
d_k	0.15**	0.07**	0.04**
d_k^*	-0.15**	-0.07**	0.00
β	0.16	0.17	0.17
No. of observations	165,857	164,556	162,084

*Panel B: Likelihood-Ratio Statistics to Test Market Efficiency Constraints**

<i>Constraint</i>	<i>k = 1</i>	<i>k = 2</i>	<i>k = 3</i>
$b_k = b_k^*$	118.59**	41.22**	9.09**
$d_k = d_k^*$	160.28**	44.88**	2.07

** Denotes significance at the 1% level.

* The likelihood-ratio statistic is distributed asymptotically as χ^2 with 1 degree of freedom.

in the same fiscal year are a direct implication of the integral method of quarterly reporting, they are not fully anticipated by investors.

One curiosity of the above results is that d_k^* is negative for $k = 1$ and 2. If investors completely ignored the higher auto-correlation between SUEs in adjacent fiscal years, then d_k^* would be exactly zero. Thus, the negative values indicate that investors not only underestimate the higher within-year auto-correlation in SUEs, but also price stocks as if they expect the intra-fiscal-year auto-correlations to be lower than the inter-fiscal-years auto-correlations. The economic significance of these results, however, is quite small.¹⁵

¹⁵ The economic significance of these results is assessed as follows. For $k = 1$, the β estimate is 0.16, indicating that a hedge portfolio taking a long position in high SUE_t stocks and a short position in low SUE_t stocks would
(Continued on next page)

In panel B of table 5, we report the likelihood-ratio test statistics for the significance of the differences between the actual and implied auto-regressive coefficients. For tests of $b_k^* = b_k$, the differences are significant at the one percent level for all three lags. For tests of $d_k^* = d_k$, the differences are statistically significant at the one percent level for the first and second lags. At lag 3, although d_k is greater than d_k^* indicating that investors ignore the stronger relation between SUEs in the same fiscal year at that lag, the test statistic is not statistically significant. Because the auto-regressive coefficient at lag 3 is so close to zero to begin with ($d_k = 0.04$), the lack of statistical significance at this lag is not surprising.

Overall, the evidence in table 5 indicates that investors systematically fail to incorporate the stronger auto-regressive coefficients between SUEs belonging to the same fiscal year. The accounting requirements mandating the integral approach to interim reporting have been in place for many years. Hence, our results beg the question of why the earnings expectations embedded in stock prices systematically underestimate the auto-regressive structure of SUE. The most straightforward explanation is that many investors do not fully understand the time-series properties of quarterly earnings. Consistent with this argument, behavioral and experimental research confirms that individuals tend to underestimate the auto-correlation in SUEs (Maines and Hand 1996; Caligari and Fargher 1997). Alternatively, certain sophisticated investors may be aware of the time-series properties of earnings and attempt to arbitrage the associated mispricing, but transaction costs and short-selling restrictions may prevent these investors from eliminating the mispricing. We stress that the principal contribution of our paper is to demonstrate that BT's hypothesis can be generalized to explain the behavior of stock returns beyond the tests performed in their original research. Additional research is required to better understand why investors' expectations are systematically biased and why mispricing is not instantaneously and completely eliminated.

IV. CONCLUSIONS

We investigate the implications of quarterly reporting requirements for the time-series properties of quarterly earnings and extend the work of Bernard and Thomas (1990) by examining the extent to which the earnings expectations embedded in stock prices reflect these time-series properties. Consistent with the implications of quarterly reporting requirements, we find that the time-series properties of quarterly earnings depend on the fiscal quarters to which earnings belong. Moreover, we find that the earnings expectations embedded in stock prices systematically underestimate the time-series properties resulting from quarterly reporting requirements. Our results therefore reinforce those of Bernard and Thomas (1990) in suggesting that the post-earnings-announcement drift reflects investors' tendency to anchor on a naive seasonal random walk earnings expectation. Ball and Bartov

Footnote 15 (Continued)

yield a cumulative return of 16 percent over the quarter ending on the announcement date of quarter t earnings. Note that in order to generate this return, investors must have perfect foresight of the SUE decile rankings beginning one quarter before the earnings announcement dates. The b_k and d_k coefficients indicate that rational investors should expect 30 percent of SUE_{t-1} to recur in SUE_t if the quarters belong to different fiscal years and 45 percent of SUE_{t-1} to recur in SUE_t if the quarters belong to the same fiscal year. If investors completely ignore information in SUE_{t-1} in forming expectations of SUE_t , then part of the 16 percent hedge portfolio abnormal return can be predicted from SUE_{t-1} . The amount of the hedge portfolio return that can be predicted depends on the first order auto-correlation in SUE. Thus, when SUE_t and SUE_{t-1} belong to different fiscal years, the predictable return will be $0.30 \times 16\% = 4.8$ percent. Similarly, when SUE_t and SUE_{t-1} belong to different fiscal years, the predictable return will be $0.45 \times 16\% = 7.2$ percent. However, the first column of panel B in table 4, indicates that the average predictable one quarter return is 3.09 percent when SUE_t and SUE_{t-1} belong to different fiscal years and 8.6 percent when SUE_t and SUE_{t-1} belong to the same fiscal year. Thus, while the predicted returns of 4.8 percent and 7.2 percent are economically "close" to the realized returns of 3.09 percent and 8.6 percent, respectively, the small differences between them cause the estimates of b_k^* and d_k^* to differ somewhat from zero.

(1996) question the credibility of BT's naive expectation hypothesis on the grounds that the earnings expectations embedded in stock prices do not completely ignore deviations from a naive seasonal random walk model. Our results, however, show that BT's hypothesis provides predictions and explanations for observed stock price behavior that can be generalized beyond their original findings. As such, our paper provides a direct example of the usefulness of the BT hypothesis. A recent paper by Alford and Berger (1997) corroborates and extends our findings, by demonstrating that analysts' earnings forecasts do not incorporate the stronger auto-correlation in SUEs belonging to the same fiscal year. Together, this evidence casts doubt on Ball and Bartov's (1996) conjecture that BT's original findings could be due to unspecified research design biases.

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Additional Evidence on the Incremental Information Content of Cash Flows and Accruals: The Impact of Errors in Measuring Market Expectations

Ray J. Pfeiffer, Jr.

Pieter T. Elgers

University of Massachusetts Amherst

May H. Lo

Western New England College

Lynn L. Rees

Texas A&M University

ABSTRACT: This study evaluates the relation between security returns and funds-based earnings components. We document that proxies for market expectations of the components that are based on measures of historical serial- and cross-dependencies are substantially more accurate than random-walk proxies. Moreover, we detect significantly higher valuations of the operating cash flow component of earnings, relative to current accruals, when market expectations are represented using the dependency-based predictions. Such differential valuation is not detectable for random-walk representations. Contrary to results in Ali (1994), we find incremental information in unexpected cash flows over the whole spectrum (moderate and extreme) of unexpected cash flow realizations.

Key Words: *Funds-based components, Valuation, Prediction, Non-linearity.*

Data Availability: *All data are available from public sources.*

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I. INTRODUCTION

Purpose and Findings

Current reporting standards for income measurement and disclosure reflect presumptions that accrual earnings are incrementally informative to investors relative to more primitive constructs (e.g., operating cash flows) and that the reporting of earnings components provides value-relevant information beyond that conveyed by aggregate earnings alone. Prior studies of the security market's valuation of funds-based earnings components consistently indicate that working capital components (operating cash flows and current accruals) have higher valuations than do noncurrent accruals. In contrast, evidence of differential valuations of cash flows and current accruals prior to Ali (1994) has been characterized as weak and inconsistent (e.g., Jennings 1990, 925; Ali 1994, 63).

This weak evidence of valuation differences between operating cash flows and current accruals runs counter to expectations that are based on at least two arguments. First, Dechow et al. (1996, 26) note that cash flows are realized in the current period, while accruals represent future-period cash flows. Consequently, the market's valuation of accruals should impound discounts for futurity and risk. Second, Sloan (1996, 298) reports that cash flows are more persistent than accruals, in the sense that future earnings levels are more highly associated with current levels of operating cash flows than with current levels of aggregate (current and noncurrent) accruals. Together, these studies imply that a dollar of operating cash flows should be more highly valued than a dollar of current accruals, with a difference in magnitude sufficient to compensate for differences in futurity, risk and persistence.

Recent studies have improved the empirical specification of the security returns/earnings components relation by relaxing the assumption that the valuation coefficients be identical for all cases. Ali (1994) uses a piecewise-linear model that allows parameter shifts for firm-years having extreme changes in the earnings components. The estimates from this piecewise model indicate that operating cash flows have higher valuation coefficients than current accruals only when the realized operating cash flow changes are moderate, i.e., below the median absolute change in operating cash flows. On the other hand, Ali (1994) is unable to detect valuation differences for extreme changes in operating cash flows, and attributes this finding to an inverse relation between the persistence and the extremity of changes in earnings components.

Prior studies of the market's valuation of unexpected changes in annual earnings components generally use random-walk (no change) predictions as proxies for market expectations of the earnings components (e.g. Rayburn 1986; Bowen et al. 1987; Ali 1994). The present study assesses the impact of the implied measure of market expectations used in relating security returns to changes in earnings components. Our empirical tests address two related issues. First, we assess the extent of auto- and cross-correlations among earnings components and attempt to exploit these historical relations in developing predictions of current period levels of the earnings components.¹ The empirical results show that these historical dependencies are sufficiently stable to enable predictions of funds-based components that are significantly more accurate than random-walk predictions. Moreover, the

¹ Wilson (1986, 1987), in event-studies of the securities market's response to quarterly earnings components, includes prior current accruals, operating cash flows, and other operating variables in equations to predict quarterly current accruals and cash flows, and infers that the market responds more strongly to cash flows relative to accruals. Bernard and Stober (1989), however, assess the generality of this relation over a longer test period, and find no supportive evidence except in the specific two-quarter test period used in Wilson (1986, 1987). Bernard and Stober (1989, 648) suggest that the short-period event-study methodology may provide too short a return window to capture the market's differential valuation of earnings components.

magnitudes and statistical significance of the improvements in predictive accuracy are greatest in cases where the realized changes in the earnings components are “extreme” as defined in Ali (1994).

More accurate predictions of earnings components, however, do not necessarily provide better representations of securities market expectations. For example, Sloan (1996) reports evidence that the market may not fully impound the differential implications of earnings components in predicting future earnings. In addition, Rangan and Sloan (1998) provide evidence that is consistent with the market not fully impounding the implications of the correlation in quarterly earnings that stems from the use of the integral method for interim reporting. For this reason, our second set of tests employ the predicted values of the earnings components to represent security market expectations in assessing the market’s valuation of unexpected changes in the components. When the predictions of earnings components that are based on historical auto- and cross-correlations are used to proxy for securities market expectations, estimation of a simple linear model of the securities returns/unexpected earnings components relation shows significant incremental valuation of operating cash flows over current accruals. Moreover, estimation of a piecewise-linear model that incorporates our adjusted measures of expectations of the earnings components indicates that operating cash flows are incrementally valued for extreme as well as for moderate measures of unexpected cash flows. One interpretation of these findings is that Ali’s (1994) inability to detect valuation differences with a simple linear model, or to detect differences for extreme operating cash flows with a piecewise-linear model, is due to measurement error in the random-walk proxy for market expectations.

The remaining discussion proceeds as follows. Section II describes the sample selection, research design and empirical results. Section III provides a summary and conclusion.

II. RESEARCH DESIGN AND EMPIRICAL RESULTS

Sample Selection and Measurement of Variables

This study uses all firm-years in the 1997 Compustat CD-ROM active and research databases for which sufficient data are available. Only calendar-year firms are included because of our reliance on intertemporal tests for purposes of assessing statistical significance.²

The earnings components are defined as in Ali (1994, 63) in order to facilitate comparisons to the results of that study. Variables used in the empirical analysis are defined as follows (Compustat item numbers and mnemonics are in parentheses):

- SAR_{jt} Size-adjusted return; defined as the difference between the realized return on firm j ’s common stock for the 12 months ended March 31 of year $t + 1$ and the mean return for all sample firms in the same size decile (where size is defined based on market value of equity (MKVALF) at the start of year t).
- E_{jt} Earnings per share; defined as net income before extraordinary items and discontinued operations (#18, EPSPX).

² Regression residuals with securities returns as the dependent variable are likely to be cross-correlated in annual cross-sections. For this reason, intertemporal tests treat each annual parameter estimate as a single observation, relying on the assumption of serial rather than cross-sectional independence in securities returns (e.g., Bernard 1987).

- WCFO_{jt}** Working capital from operations per share; defined as earnings per share plus adjustments for elements of earnings not affecting working capital. Through 1986, WCFO_{jt} is equal to total funds from operations (#110, FOPT). After 1986, WCFO_{jt} is defined as the sum of Compustat data items #106 (ESUBC), #123 (IBC), #124 (XIDOC), #125 (DPC), #126 (TXDC), #213 (SPPIV) and #217 (FOPO).
- CFO_{jt}** Cash flows from operations per share; defined as WCFO_{jt} minus the change in noncash current assets from operations (change in data items #2 (RECT), #3 (INVT), and #68 (ACO)) plus the change in current liabilities from operations (change in data items #70 (AP), #71 (TXP), and #72 (LCO)).
- CA_{jt}** Current accruals per share; defined as WCFO_{jt} minus CFO_{jt}.
- NCA_{jt}** Noncurrent accruals per share; defined as E_{jt} minus WCFO_{jt}.

Per share values of each earnings component are computed using common shares used to compute primary earnings per share (#54, CSHPR1). All components are scaled by share price at the start of the earnings year (#199, PRCCF).³ To mitigate the potential effects of outliers, all firm-years with returns or scaled earnings variables exceeding |1.0| were deleted. This screen resulted in the deletion of approximately five percent of available firm-years, which compares to six percent of cases deleted using the same screen in Ali (1994, 71).

Serial Dependencies and the Prediction of Funds-Based Earnings Components

In order to show empirically the serial relations among the funds-based earnings components for the firms included in our sample, table 1 reports selected auto- and cross-correlations for lags of one and two years. Consistent with prior research (e.g., Dechow 1994, table 2), panel A of table 1 shows that all auto-correlation coefficients are substantially less than one, indicating that the components exhibit strong mean reversion tendencies. This tendency is most pronounced for current accruals and is least pronounced for noncurrent accruals.⁴

Contemporary and lagged cross-correlations are reported in panel B of table 1. Operating cash flows are negatively correlated with both current and noncurrent accruals, consistent with the long-standing argument that accruals mitigate timing problems in cash flows as measures of earnings performance (e.g., Paton and Stevenson 1920, 224 and ff.; Dechow 1994, 7). The serial cross-correlation between each pair of components suggests that current period expectations for a given component that are conditioned on past realizations of each of the three components will be more accurate than random-walk expectations.⁵

The relations in table 1 suggest the potential usefulness of lagged values of the funds-based earnings components in conditioning expectations for the current period. For this reason, the following relation was estimated for each of the components:

$$C_{jt} = \beta_0 + \sum_{i=1}^N \beta_i \text{CFO}_{jt-i} + \sum_{i=1}^N \alpha_i \text{CA}_{jt-i} + \sum_{i=1}^N \gamma_i \text{NCA}_{jt-i} + e_{jt} \quad (1)$$

³ Qualitatively similar results (not reported herein) are obtained when defining cash from operations as operating income before depreciation, interest and taxes less current accruals, as in Dechow (1994, 16).

⁴ The cross-sectional variance in the price-scaled levels of the components (not reported) is reasonably stable over time. A stable variance and an auto-correlation below one imply a mean reversion tendency. Mean-reversion in the levels of earnings components is also consistent with the negative auto-correlations in consecutive changes in the earnings components reported in Ali (1994, table 2).

⁵ The subsequent analyses will provide tests of this intuition in prediction models that employ all components.

TABLE 1
Auto- and Cross-Correlations Among Funds-Based Earnings Components
(n = 22,839 firm-years, 1980–1996)^a

Panel A: Auto-Correlations

<i>Earnings Component^b</i>	<i>One-Period Lag</i>		<i>Two-Period Lag</i>	
Cash flows (CFO)	CFO _t , CFO _{t-1}	+0.41	CFO _t , CFO _{t-2}	+0.33
Current accruals (CA)	CA _t , CA _{t-1}	+0.10	CA _t , CA _{t-2}	+0.01
Non-current accruals (NCA)	NCA _t , NCA _{t-1}	+0.60	NCA _t , NCA _{t-2}	+0.48

Panel B: Cross-Correlations

<i>Earnings Components</i>	<i>Contemporaneous</i>		<i>One-Period Lag</i>	
Cash flows and current accruals	CFO _t , CA _t	-0.57	CFO _t , CA _{t-1}	-0.07
			CA _t , CFO _{t-1}	-0.04
Cash flows and noncurrent accruals	CFO _t , NCA _t	-0.48	CFO _t , NCA _{t-1}	-0.41
			NCA _t , CFO _{t-1}	-0.34
Current accruals and noncurrent accruals	CA _t , NCA _t	+0.03	CA _t , NCA _{t-1}	+0.04
			NCA _t , CA _{t-1}	+0.05

^a All correlations are reported as the average of 17 annual cross-sectional correlations estimated in each year 1980–1996.

^b CFO_t, CA_t and NCA_t are operating cash flows, current (noncash working capital) accruals, and noncurrent accruals in year *t*, respectively. All earnings components are scaled by share price measured at the start of the earnings year.

where C_{jt} , the dependent variable, is specified alternatively as operating cash flows (CFO_{jt}), noncash working capital accruals (CA_{jt}) and noncurrent accruals (NCA_{jt}). The number of lags, *N*, was varied from one to three. Although multiple lags for individual components appeared to be statistically significant in several years, the coefficients varied widely over time, and only the coefficients for the one-period lags were all reliably different from zero based upon intertemporal *t*-tests.⁶ For this reason, table 2 reports the estimation results only for the specification that includes a single lag for each component.⁷

The results in table 2 show that lagged cross-correlations of all three earnings components are incremental to auto-correlations, in association with subsequent levels of each component.⁸ For example, the squared values of the one-period auto-correlations that were reported in panel A of table 1 are 0.168, 0.010 and 0.360 for CFO_{jt}, CA_{jt} and NCA_{jt}, respectively. In the associations reported in table 2, the corresponding *R*²s are 0.265, 0.035 and 0.366. The percentage improvement from incorporating the lagged cross-correlations are greatest for CFO_{jt} and CA_{jt}, implying that the degree of measurement error in the random-walk expectation differs across components. The significant intertemporal *t*-values suggest

⁶ The apparent statistical significance of multiple lags in various years is based upon *t*-values in cross-sectional regressions, which are likely to be inflated due to cross-correlations in the regression residuals.

⁷ Results over all lags are available upon request.

⁸ An exception is the statistically insignificant relation of noncurrent accruals (NCA_{jt}) to lagged cash flows (CFO_{jt-1}) shown in panel C of table 2.

TABLE 2
Regression Relations of Funds-Based Earnings Components to One-Period Lagged Values
(n = 22,839, years 1980–1996)*

	$\text{Model:}^b C_{jt} = \beta_0 + \beta_1 \text{CFO}_{jt-1} + \beta_2 \text{CA}_{jt-1} + \beta_3 \text{NCA}_{jt-1} + e_{jt}$				
	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\beta}_3$	$\bar{R}_{adj}^2$
<i>Panel A: CFO_{jt} as the Dependent Variable</i>					
Parameter	0.047	0.457	0.281	−0.279	0.265
(t-value)	(7.35)*	(17.91)*	(11.14)*	(−9.23)*	
No. positive ^c	17/17*	17/17*	17/17*	0/17*	
$\sigma(\hat{\beta}_j)^d$	0.026	0.105	0.104	0.125	
<i>Panel B: CA_{jt} as the Dependent Variable</i>					
Parameter	−0.005	0.155	0.224	0.175	0.035
(t-value)	(−1.04)	(6.58)*	(9.85)*	(5.24)*	
No. positive	8/17	17/17*	17/17*	16/17*	
$\sigma(\hat{\beta}_j)$	0.020	0.097	0.094	0.138	
<i>Panel C: NCA_{jt} as the Dependent Variable</i>					
Parameter	−0.043	0.014	0.065	0.653	0.366
(t-value)	(−21.74)*	(0.80)	(3.06)*	(15.46)*	
No. positive	0/17*	9/17	13/17	17/17*	
$\sigma(\hat{\beta}_j)$	0.008	0.073	0.088	0.174	

* Significant at a probability below 0.01.
^a All parameter estimates are reported as the averages from 17 annual cross-sectional regressions, estimated in each year 1980–1996. The t-values and standard deviations are measured using the 17 annual observations of each parameter.
^b C_{jt} is specified alternately as CFO_{jt}, CA_{jt} and NCA_{jt}. CFO_{jt}, CA_{jt}, and NCA_{jt} are operating cash flows, current (noncash working capital) accruals, and noncurrent accruals in year t, respectively. All earnings components are scaled by share price measured at the start of the earnings year.
^c A binomial test is used to test whether the percentage of positive coefficients is significantly different from 50%.
^d $\sigma(\hat{\beta}_j)$ is the standard deviation of the 17 annual estimates of parameter β_j .

that the parameters of these relationships are reasonably stable over time. If so, the model specifications reported in table 2 may be useful in developing *ex ante* predictions of the components (i.e., predictions that are based upon information that is available before the start of the prediction period).

In order to evaluate the accuracy of predictions of components that are based upon historical dependencies, the models reported in table 2 were re-estimated in each year, 1980 through 1995, using only those observations available from prior years (e.g., the parameters to be used in predicting 1985's components were estimated by pooling all available data from 1980 through 1984). To facilitate comparisons with Ali (1994) the components were aggregated to measure working capital from operations, WCFO (CFO + CA), and earnings,

E (CFO + CA + NCA). As in Ali (1994), the absolute values of the changes in earnings (ΔE_t), working capital from operations ($\Delta WCFO_t$), and cash flow from operations (ΔCFO_t) were ranked in each year t ; cases below the cross-sectional median were characterized as “moderate” and otherwise as “extreme.”

Table 3 provides comparisons of the predictive accuracy between the random-walk and the serial-dependency-based expectations for each of the three earnings components. Without specific knowledge of investors’ loss functions associated with prediction errors, it is not possible to identify a “best” measure of predictive accuracy. Thus, we report the mean squared prediction error (MSPE) metric because of its long-standing popularity as a gauge of earnings prediction accuracy (e.g., Elton et al. 1984; Ali et al. 1992). We also report the product-moment correlation of realized and predicted values. In addition, we report the correlation of size-adjusted securities returns and unexpected changes in the components because of its pertinence to the market valuation tests we present in the subsequent section of the paper.

In table 3, the comparisons of predictive accuracy for all cases combined (the first pair of columns) show that the serial-dependency-based predictions are in general significantly more accurate, at probability values below 0.01, than the random-walk predictions.⁹ Within the sample partitions based on the extremity of the realized changes in the earnings components, the serial-dependency-based predictions are significantly more accurate for all error metrics except for the MSPE metric for moderate changes. This latter result is not surprising, because the membership of the moderate and extreme groups was determined based upon *ex post* measures of the magnitudes of the random-walk prediction errors.

The correlations of size-adjusted securities returns and unexpected changes in the earnings components reported in table 3 show that all correlations are significantly higher (probability below 0.01) when expectations are based upon serial dependencies. This result supports the view that investor expectations of these components at least partially reflect the historical dependencies upon which our predictions are based.¹⁰

In general, the results in table 3 demonstrate that the historical auto- and cross-correlations among earnings components are sufficiently stable to enable significant improvements in forecast accuracy beyond that achievable with random-walk expectations. Moreover, predictions of the earnings components that are based upon these historical dependencies appear to be more aligned with security market expectations of these earnings components than are random-walk (no change) predictions. The subsequent section will examine whether the use of predictions of earnings components based on these historical dependencies as proxies for investors’ expectations affects inferences about the market’s incremental valuation of cash flows from operations.

Predicted Values of Components as Representations of Market Expectations

The previous section developed predictions of each component of earnings based on auto- and cross-correlations among the earnings components. The following tests evaluate whether inferences about the incremental content of earnings components are sensitive to whether component expectations come from a random-walk model or from a model that incorporates the historical auto- and cross-correlation structure in the components. Table 4 provides a replication of Ali’s (1994, tables 1 and 3) results, based upon random-walk

⁹ An exception is the insignificant difference in the correlation of actual and predicted earnings.

¹⁰ Our tests do not assess whether the market fully impounds the implications of these historical dependencies. Sloan (1996) reports evidence of market mispricing with respect to the cash flow and accrual components of earnings, while Rangan and Sloan (1998) report evidence of market mispricing with regard to the correlation structure in quarterly earnings.

TABLE 3
Comparisons of Prediction Accuracy for Funds-Based Earnings Components Based on
Random-Walk and Serial-Dependency Predictions
(n = 22,253, years 1981-1996)^{a,b}

Accuracy measure:	All Cases		Moderate Changes ^h		Extreme Changes	
	Random Walk ^f	Serial Dependency ^g	Random Walk	Serial Dependency	Random Walk	Serial Dependency
<i>Panel A: Predictions of Cash Flows from Operations (CFO_t)</i>						
MSPE*100 ^c	3.25	2.12*	0.10‡	0.37	6.39	3.86*
$\rho(\text{CFO}_t, E[\text{CFO}_t])^d$	0.44	0.57*	0.86	0.89*	0.30	0.45*
$\rho(\text{SAR}_t, \text{UCFO}_t)^e$	0.07	0.17*	0.07	0.24*	0.09	0.17*
<i>Panel B: Predictions of Working Capital from Operations (WCFO_t)</i>						
MSPE*100	1.66	1.21*	0.04‡	0.17	3.29	2.25*
$\rho(\text{WCFO}_t, E[\text{WCFO}_t])$	0.64	0.68*	0.88	0.94*	0.55	0.59*
$\rho(\text{SAR}_t, \text{UWCFO}_t)$	0.20	0.29*	0.15	0.26*	0.25	0.32*
<i>Panel C: Predictions of Earnings (E_t)</i>						
MSPE*100	2.05	1.30*	0.03‡	0.13	4.06	2.47*
$\rho(E_t, E[E_t])$	0.52	0.52	0.84	0.89*	0.44	0.45
$\rho(\text{SAR}_t, \text{UE}_t)$	0.21	0.32*	0.19	0.33*	0.25	0.35*

CFO_t, E[CFO_t] = actual and predicted values of cash flow from operations per share in year t (scaled by beginning share price);

WCFO_t, E[WCFO_t] = actual and predicted values of working capital from operations per share in year t (scaled by beginning share price);

E_t, E[E_t] = actual and predicted values of earnings before extraordinary items and discontinued operations per share in year t (scaled by beginning share price);

SAR_t = size-adjusted common stock return for the 12 months ended March 31 of year t + 1.

* Serial-dependency-based prediction is more accurate at a probability below 0.01.

‡ Random-walk-based prediction is more accurate at a probability below 0.01.

^a The predictions of earnings components evaluated in this table are developed from the regression models described in table 2. Because at least one prior year is required for parameter estimation, the first year with available predictions is 1981.

^b All of the accuracy measures reported in the table are averages of the measures that were computed in each year, 1981-1996. Correspondingly, all tests of differences in accuracy between the random-walk and serial-dependency predictions are based on matched-pair intertemporal t-tests, i.e., on the vector of 16 annual differences in accuracy.

^c MSPE is the squared difference between the actual and predicted values of each earnings component. Reported numbers are multiplied by 100 to suppress leading zeros.

^d Pearson correlations between the actual and expected values of each earnings component. The expected value, E[C_t], is the prior year's level (random walk) or the predicted value (serial dependency) of the component.

^e Pearson correlation between size-adjusted security returns, SAR_t, and unexpected value of the earnings components. Unexpected values are measured as differences from the prior year's level of the component (random walk) or the predicted value of the component (serial dependency).

^f The random-walk prediction for each earnings component is the level of the component in the prior year.

^g The serial-dependency predictions for each earnings component are developed by estimating the parameters of the regression models reported in table 2. For purposes of prediction, the parameters are estimated by pooling all firm-years available from 1980 through the year preceding the prediction year.

^h Extremity of the earnings components is specified as in Ali (1994), i.e., cases below (at or above) the cross-sectional median absolute value of the share-price scaled change in the component in year t are classified as moderate (extreme).

TABLE 4
Relations of Size-Adjusted Security Returns to Changes in Earnings Components
(n = 22,253 firm-years, 1981–1996)

Panel A: Linear Model

	Model: $SAR_j = \beta_0 + \beta_1 \Delta E_j + \beta_2 \Delta WCF O_j + \beta_3 \Delta CFO_j + \epsilon_j$			
	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\beta}_3$
Parameter estimate ^a	-0.030	0.312	0.294	-0.002
(t-value) ^b	(-9.25)*	(7.45)*	(8.66)*	(-0.08)
No. positive ^c		16/16*	16/16*	9/16
$\sigma(\hat{\beta}_j)$ ^d		0.167	0.136	0.100
				$\bar{R}_{adj}^2$ 0.052

Panel B: Piecewise-Linear Model

	Model: $SAR_j = \alpha_0 + \alpha_1 \Delta E_j + \alpha_2 D^E \Delta E_j + \alpha_3 \Delta WCF O_j + \alpha_4 D^{WC} \Delta WCF O_j + \alpha_5 \Delta CFO_j + \alpha_6 D^{CF} \Delta CFO_j + \mu_j$									
	$\hat{\alpha}_0$	$\hat{\alpha}_1$	$\hat{\alpha}_2$	$\hat{\alpha}_3$	$\hat{\alpha}_4$	$\hat{\alpha}_5$	$\hat{\alpha}_6$	$(\hat{\alpha}_1 + \hat{\alpha}_2)$	$(\hat{\alpha}_5 + \hat{\alpha}_6)$	$\bar{R}_{adj}^2$
Parameter est.	-0.034	2.654	-2.353	1.264	-0.990	0.510	-0.514	0.301	0.275	0.065
(t-value)	(-9.73)*	(14.29)*	(-12.48)*	(5.66)*	(-4.59)*	(3.62)*	(-3.53)*	(7.40)*	(8.49)*	(-0.17)
No. positive	16/16*	16/16*	0/16*	15/16*	2/16*	13/16	3/16	16/16*	16/16*	8/16
$\sigma(\hat{\alpha}_j)$	0.743	0.754	0.894	0.862	0.862	0.563	0.583	0.163	0.129	0.100

SAR_j = size-adjusted common stock return for the 12 months ended March 31 of year $t + 1$;

ΔE_j , $\Delta WCF O_j$, ΔCFO_j = annual change in earnings per share before extraordinary items and discontinued operations, working capital from operations per share, and cash flow from operations per share for year t , respectively. All three variables are scaled by share price at the start of the earnings year.

D^E , D^{WC} , D^{CF} = indicator variables equal to 1 when the absolute values of ΔE , $\Delta WCF O$, and ΔCFO are at or above their annual cross-sectional medians and zero otherwise.

* Significant at a probability below 0.01.

^a Parameter estimates are the means of 16 parameter estimates obtained in cross-sectional regressions in each year 1981–1996.

^b The t-values are based upon the means and standard deviations of the 16 annual estimates of each parameter.

^c A binomial test is used to test whether the percentage of positive coefficients is significantly different from 50%.

^d $\sigma(\hat{\beta}_j)$ [$\sigma(\hat{\alpha}_j)$] is the standard deviation of the 16 annual estimates of parameter β_j [α_j].

proxies for security market expectations of the earnings components. Panel A of table 4 shows the result of estimating the following linear model relating security returns and changes in funds-based earnings components:

$$SAR_j = \beta_0 + \beta_1 \Delta E_j + \beta_2 \Delta WCFO_j + \beta_3 \Delta CFO_j + \epsilon_j \quad (2)$$

where SAR_j is the size-adjusted stock return of firm j in year t , and ΔE_j , $\Delta WCFO_j$ and ΔCFO_j represent the contemporaneous changes in earnings, working capital from operations, and cash flow from operations, respectively (time subscripts are omitted). A positive value for β_1 indicates that noncurrent accruals are informative given the information in cash flows and current accruals; a positive value for β_2 indicates that current accruals are more highly valued than noncurrent accruals; and a positive value for β_3 indicates that cash flows are more highly valued than current accruals. The implied market response to changes in these earnings components is β_1 for noncurrent accruals, $(\beta_1 + \beta_2)$ for current accruals, and $(\beta_1 + \beta_2 + \beta_3)$ for cash flows.¹¹

The results in table 4 are presented based on separate cross-sectional estimation in each year, 1981 through 1996. The 16 annual estimates of each parameter are treated as individual cases for purposes of statistical inference to avoid potential problems of cross-correlations in regression residuals (Bernard 1987).

The estimation results for the linear model in panel A of table 4 correspond to those in Ali (1994, table 1); i.e., current accruals are valued incrementally to noncurrent accruals ($\hat{\beta}_2$ is significantly positive), but there is no statistically reliable difference between the valuation of current accruals and cash flows ($\hat{\beta}_3$ is not significant).

Following Ali (1994), we next relax the linearity restriction in model (2) by estimating the following piece-wise linear model:

$$SAR_j = \alpha_0 + \alpha_1 \Delta E_j + \alpha_2 D^E \Delta E_j + \alpha_3 \Delta WCFO_j + \alpha_4 D^{WC} \Delta WCFO_j \\ + \alpha_5 \Delta CFO_j + \alpha_6 D^{CF} \Delta CFO_j + \mu_j \quad (3)$$

where D_j^E (D_j^{WC} , D_j^{CF}) are (0,1) dummy variables with a value of zero when the absolute value of ΔE_j ($\Delta WCFO_j$, ΔCFO_j) is below the cross-sectional median in a given year, and a value of one otherwise. In this formulation, moderate changes in CFO are more highly valued than CA if α_5 significantly exceeds zero, and extreme changes in CFO are more highly valued if $(\alpha_5 + \alpha_6)$ significantly exceeds zero. The estimation results, in panel B of table 4, correspond to those in Ali (1994, table 3): the coefficient on unexpected cash flows is significant when the cash flow change is moderate ($\hat{\alpha}_5 = 0.510$, $t = 3.62$), but is not significant when the cash flow change is extreme ($\hat{\alpha}_5 + \hat{\alpha}_6 = -0.004$, $t = -0.17$).

Table 4 uses realized changes in the earnings components to represent unexpected changes in order to replicate Ali (1994). In contrast, table 5 estimates the same relations, using the serial dependency-based predictions to represent securities market expectations. Panel A provides estimation results for the following linear model:

$$SAR_j = \gamma_0 + \gamma_1 UE_j + \gamma_2 UWCFO_j + \gamma_3 UCFO_j + \epsilon_j \quad (4)$$

where UE_j , $UWCFO_j$, and $UCFO_j$ represent unexpected earnings, working capital from operations and cash flows, respectively, and expectations are measured as the predicted

¹¹ Jennings (1990) provides an explicit demonstration of these relations.

TABLE 5
Relations of Size-Adjusted Security Returns to Unexpected Earnings Components
(n = 22,253 firm-years, 1981–1996)

Panel A: Linear Model

	Model: $SAR_j = \gamma_0 + \gamma_1 UE_j + \gamma_2 UWCFO_j + \gamma_3 UCFO_j + \epsilon_j$			
	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$
Parameter estimate ^a	-0.015	0.689	0.328	0.111
(t-value) ^b	(-5.01)*	(10.47)*	(6.92)*	(5.91)*
No. positive ^c		16/16*	15/16*	15/16*
$\sigma(\hat{\beta}_1)$ ^d		0.263	0.190	0.075
				$\frac{\bar{R}_{adj}^2}{0.115}$

Panel B: Piecewise-Linear Model

	Model: $SAR_j = \delta_0 + \delta_1 UE_j + \delta_2 D^E UE_j + \delta_3 UWCFO_j + \delta_4 D^{WC} UWCFO_j + \delta_5 UCFO_j + \delta_6 D^{CF} UCFO_j + \mu_j$									
	$\hat{\delta}_0$	$\hat{\delta}_1$	$\hat{\delta}_2$	$\hat{\delta}_3$	$\hat{\delta}_4$	$\hat{\delta}_5$	$\hat{\delta}_6$	$\frac{(\hat{\delta}_5 + \hat{\delta}_2)}{(\hat{\delta}_1 + \hat{\delta}_2)}$	$\frac{(\hat{\delta}_3 + \hat{\delta}_4)}{(\hat{\delta}_5 + \hat{\delta}_6)}$	$\frac{\bar{R}_{adj}^2}{0.138}$
Parameter est.	-0.020	4.236	-3.573	1.466	-1.163	0.670	-0.583	0.663	0.303	0.088
(t-value)	(-5.54)*	(8.81)*	(-7.90)*	(6.86)*	(-5.68)*	(5.43)*	(-4.77)*	(10.34)*	(6.50)*	(4.82)*
No. positive	16/16*	16/16*	0/16*	14/16*	2/16*	15/16*	2/16*	16/16*	15/16*	14/16*
$\sigma(\hat{\alpha}_1)$		1.923	1.809	0.855	0.820	0.494	0.489	0.257	0.186	0.073

SAR_j = size-adjusted common stock return for the 12 months ended March 31 of year t + 1;

UE_j , $UWCFO_j$, $UCFO_j$ = unexpected earnings, unexpected working capital from operations, and unexpected operating cash flows, respectively, where expectations are measured as the predicted values of the earnings components based on the serial dependency models in table 2. All three variables are scaled by share price at the start of the earnings year;

D^E , D^{WC} , D^{CF} = indicator variables equal to 1 when the absolute values of UE , $UWCFO$, and $UCFO$ are at or above their annual cross-sectional medians and zero otherwise;

* Significant at a probability below 0.01.

^a Parameter estimates are the means of 16 parameter estimates obtained in cross-sectional regressions in each year 1981–1996.

^b The t-values are based upon the means and standard deviations of the 16 annual estimates of each parameter.

^c A binomial test is used to test whether the percentage of positive coefficients is significantly different from 50%.

^d $\sigma(\hat{\gamma}_1)/[\sigma(\hat{\delta}_1)]$ is the standard deviation of the 16 annual estimates of parameter γ_1 [δ_1].

values of the earnings components based on the serial dependency models. The estimation results in panel A of table 5 show that, even in the context of a simple linear model, cash flows appear to be valued more highly than current accruals ($\hat{\gamma}_3 = 0.111$, $t = 5.91$). Moreover, the predictions of earnings components based on serial dependencies appear to be better representations of securities market expectations. In comparing the estimation results in panel A of tables 4 and 5, the adjusted R^2 of the returns/earnings components relation more than doubles (from 0.052 in panel A of table 4 to 0.115 in panel A of table 5), and the valuation coefficients on each of the earnings components are higher when the random-walk expectation is replaced by predictions that are based upon serial dependencies.

In order to determine whether differentially higher valuations of operating cash flows are detectable over the whole spectrum (moderate and extreme) of unexpected cash flows, panel B of table 5 relaxes the strict linearity assumption in model (4) by estimating the following relation:

$$\begin{aligned} \text{SAR}_j = & \delta_0 + \delta_1 \text{UE}_j + \delta_2 D^E \text{UE}_j + \delta_3 \text{UWCFO}_j + \delta_4 D^{\text{WC}} \text{UWCFO}_j \\ & + \delta_5 \text{UCFO}_j + \delta_6 D^{\text{CF}} \text{UCFO}_j + \mu_j \end{aligned} \quad (5)$$

where D_j^E (D_j^{WC} , D_j^{CF}) are (0,1) dummy variables with a value of zero when the absolute value of UE_j (UWCFO_j , UCFO_j) is below the cross-sectional median in a given year, and a value of one otherwise. The estimation results in panel B of table 5 indicate significantly higher valuations of cash flows relative to current accruals both when unexpected cash flows are moderate ($\hat{\delta}_5 = 0.670$, $t = 5.43$), and when the unexpected cash flows are extreme ($\hat{\delta}_5 + \hat{\delta}_6 = 0.088$, $t = 4.82$). This result is in contrast to Ali's (1994) inability to detect differential valuations for extreme changes in cash flows, using a random-walk proxy for securities market expectations.

Overall, the estimation results in tables 4 and 5 indicate that the incremental securities market valuations of cash flows over current accruals that are undetectable with a random-walk proxy for market expectations are significantly positive when expectations are proxied by predictions from historical dependencies among the earnings components. Moreover, the differential positive valuation of cash flows is apparent for both moderate and extreme unexpected changes in cash flows. The higher $\bar{R}_{adj}^2$ values in panels A and B of table 5 suggest that predictions of funds-based earnings components that are based on historical auto- and cross-correlations among the components are better representations of investors' expectations than is the random-walk (no change) prediction that has characterized the previous related research.

III. SUMMARY AND CONCLUSIONS

This study has evaluated the relation among security returns and funds-based earnings components by incorporating the predictive information in historical serial- and cross-correlations among the earnings components. We document substantial improvements in prediction accuracy, relative to random-walk (no change) predictions, for predictions of the components that are based on historical estimates of these linear dependencies. Moreover, we detect significantly higher valuations of the operating cash flow component of earnings, relative to current accruals, when the predictions of components based on past dependencies are used to represent market expectations. Such differential valuation was not detectable for random-walk (no change) representations.

Our results indicate that there is incremental information in unexpected cash flows over the whole spectrum (moderate and extreme) of unexpected cash flow realizations. The lower

associations in the tail areas found by Ali (1994) apparently reflect differences in the degree of measurement error in the random-walk expectation model, as well as possible differences in the permanence of extreme observations.

These results are consistent with the joint hypotheses that cash flows have incremental information content (over current accruals), and that market expectations impound, at least in part, the measured correlation structure among historical levels of the earnings components. We find that return regressions with independent variables that incorporate historical correlation structure have more explanatory power than regressions with independent variables that are based upon random-walk expectations. For this reason, we interpret our predictions of earnings components to be more aligned with market expectations than are random-walk predictions. On the other hand, our results do not imply that securities prices fully impound the predictive information in earnings components. Recent evidence by Sloan (1996) of possible mispricing by the market of the cash and accrual components of earnings suggests that the market under- (over-) values the cash (accrual) components of earnings. Future research might endeavor to develop and incorporate adjustments for such mispricing, and thereby provide alternative tests of differential valuation of these earnings components in light of the apparent mispricing.

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Rate-Regulated Enterprises and Mandated Accounting Changes: The Case of Electric Utilities and Post-Retirement Benefits Other than Pensions (SFAS No. 106)

Julia M. D'Souza
Cornell University

ABSTRACT: This paper investigates the reporting and contracting responses of electric utilities to SFAS No. 106. Expense-increasing accounting standards generally have no direct cash flow consequences for nonregulated firms, but they reduce these firms' reported net income and increase their reported liabilities. Past research documents that managers of nonregulated firms seek to avert potential contracting costs associated with such mandated accounting changes through operating, financing or reporting decisions that mitigate the financial statement impact of the accounting change. In contrast, expense-increasing accounting standards do not usually affect rate-regulated firms' net income, but do have a positive effect on their cash flows because the rate recovery mechanism is based on accounting numbers. Managers of rate-regulated firms therefore have incentives to respond to expense-increasing accounting standards in ways that enhance the financial statement impact of the accounting change. This study documents that managers of rate-regulated firms that face greater uncertainties about future rate recoveries have greater incentives to use discretionary choices that intensify the impact of expense-increasing accounting changes on current financial statements.

Key Words: *Retiree health benefits, SFAS No. 106, Regulated industries, Electric utilities.*

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I. INTRODUCTION

Past research documents that accounting standards that increase recognized expenses or liabilities can have adverse effects for shareholders and managers of nonregulated firms. Such accounting standards can precipitate potentially costly debt contract renegotiations (Lev 1979; Collins et al. 1981; Lys 1984). Moreover, because accounting numbers are frequently used, either explicitly or implicitly, as a measure of managerial performance in compensation contracts (Healy 1985; Antle and Smith 1986), expense-increasing accounting standards can also directly affect managers' compensation. Consequently, managers of nonregulated firms have incentives to mitigate the financial statement effect of such mandated accounting changes through operating or financing decisions (Horwitz and Kolodny 1980; Elliott et al. 1984; Imhoff and Thomas 1988; Dechow and Sloan 1991), or through income-increasing accounting accruals (Soo 1991). Reflecting on these offsetting responses, Imhoff and Thomas (1988, 281) state:

magnitudes of firm responses are determined by factors such as the magnitude of the standard's impact on relevant accounting ratios and the amount of preadoption "slack" relative to limits specified in affected contracts.

This study argues that the responses of rate-regulated firms' managers to expense-increasing accounting standards are likely to differ from those of nonregulated firms because the rate-regulated environment is characterized by unique features.¹ First, the financial integrity of firms is, to a large extent, protected under a regulated regime. Therefore, regulated firms are unlikely to experience the same contracting costs as nonregulated firms as a result of the impact of mandated accounting changes on debt covenants. Second, regulators determine firms' permitted revenues, which generally include the recovery of all recognized service costs (including depreciation and taxes), plus an allowed return on investment. Expense-increasing accounting standards do not, therefore, generally affect these firms' net income. Even if managerial compensation contracts were based on accounting rates of return, it is unlikely that managers of these firms would be adversely affected by expense-increasing accounting standards. Third, and perhaps most important, expense-increasing accounting standards are likely to have positive cash flow consequences for rate-regulated firms, because recognized accounting costs are generally recovered in concurrent rates. Consequently, I argue that managers of rate-regulated firms have incentives to respond to an expense-increasing accounting standard in ways that accentuate the impact of the accounting change on recognized expenses, in contrast to the mitigating responses documented for nonregulated firms. Further, the incentives to enhance recognized current expenses rise as uncertainty about the rate-regulated firm's future environment increases.²

¹ Multi-industry studies often lack the power to capture relationships that are highly contextual (see Barnard and Stober 1989). The one-industry approach also reduces the risk of biases arising from possible omitted variables. Beaver et al. (1989, 158) note, "heterogeneity...across firms often makes it difficult to aggregate sample evidence in a meaningful and (statistically powerful) way." Barnard (1989, 93) states, "The literature would be well served if (the single industry) approach became a trend."

² Bowen (1981, 4) states that a utility's regulatory climate combined with concerns over future inflation, demand and technology contribute to the level of uncertainty associated with its future cash flows.

This study focuses on electric utility responses to SFAS No. 106 (FASB 1990), an expense-increasing accounting standard, for which accrued expense recovery has been permitted in concurrent rates in most jurisdictions in the country (Edison Electric Institute 1993).³ It investigates two discretionary choices made by electric utilities in the context of SFAS No. 106: reporting and contracting choices.⁴ Research on responses of nonregulated firms to SFAS No. 106 documents that financially weaker firms mitigate the financial statement impact of the new accounting standard by amending retiree benefit plans (Mittelstaedt et al. 1995) and choosing assumptions that result in lower cost estimates (Amir and Gordon 1996). In contrast, I hypothesize that electric utilities that face bigger uncertainties about their ability to recover costs in future rates have greater incentives to choose cost-inflating assumptions and to refrain from benefit plan amendments, because higher accrued SFAS No. 106 expenses translate into greater current cash inflows.

Results are consistent with these hypothesized incentives. They strongly indicate that competitively weaker utilities (high-cost producers with a more price-sensitive customer base) use more cost-inflating SFAS No. 106 assumptions, and show a greater propensity to refrain from retiree health plan reductions. The use of cost-inflating assumptions and the postponement of post-retirement benefit plan reductions to future periods enable utilities to frontload SFAS No. 106 costs. They are expected to benefit from such strategies if regulators do not demand perfect *ex post* settlement of cost estimates recovered in prior periods' rates, or if structural changes in the industry (e.g., deregulation) preclude such settlements. Competitively weak utilities face greater uncertainties about their future prospects in a deregulated environment. The imminence of industry deregulation thus provides even more incentive for such competitively weak utilities to frontload post-retirement benefit costs, while customers still pay rates established by public utility commissions.

The rest of this paper is organized as follows: Section II situates this study in the context of past research, and describes the background against which electric utilities operate; section III describes the study's research design, and discusses specific econometric issues associated with the methodology used; section IV develops hypotheses, and describes sample selection and variable specification issues. Results are presented in section V, and concluding remarks in section VI.

II. BACKGROUND

Prior Research

Much of the past research on firm responses to a mandated accounting change has focused on whether managers alter their operating, investing or financing decisions in the wake of the new accounting standard. For instance, Horwitz and Kolodny (1980), Elliott et al. (1984) and Selto and Clouse (1985) analyze changes in research and development (R&D) following SFAS No. 2 (*Accounting for Research and Development Costs*) (FASB 1974) that required firms to expense R&D costs that could previously be capitalized. This research finds some evidence that managers curtail R&D expenditures following SFAS No. 2, thereby dampening the income statement impact of the new accounting standard. Dechow

³ In two jurisdictions, regulators decided to continue on a pay-as-you-go basis for rate-making purposes. Utilities operating primarily in either of the last two jurisdictions are not included in the sample.

⁴ Electric utilities were almost uniform in their adoption timing and transition obligation choices, unlike non-regulated firms (see Amir and Livnat 1996). Almost all electric utilities adopted SFAS No. 106 in 1993 and recognized the transition obligation on a prospective basis. Utility choices are likely to have been constrained by the timing and nature of regulatory decisions. Regulatory decisions pertaining to SFAS No. 106 were generally made in 1993, and regulators have permitted only a portion of the transition obligation to be recovered in annual rates (typically 1/20).

and Sloan (1991) document that managers' incentives to offset the income statement impact of SFAS No. 2 are significantly related to their time horizon. Managers due to retire soon and, therefore, less likely to expect benefits from R&D investments to accrue to themselves, exhibit a greater propensity to refrain from such income-reducing expenditures.

Soo (1991) argues that an accounting response is likely to be a less costly way for managers to deal with the effect of an accounting change. He analyzes two accounting standards, SFAS No. 2 and SFAS No. 34 (*Capitalization of Interest Cost*) (FASB 1979), and finds that managers mitigate the income statement effect of these mandated accounting changes through the use of accounting accruals and through adoption timing decisions.

Expense-increasing accounting changes generally have no impact on the net income of rate-regulated firms, but they have a potentially positive impact on their cash flows. Consequently, these firms are likely to make discretionary choices that increase the income statement impact of expense-increasing accounting changes, because this generally translates into higher current cash flows. The incentive to make discretionary choices that intensify the impact of expense-increasing accounting standards on current financial statements is expected to be higher for rate-regulated firms who face greater future uncertainties. Consistent with this intuition, this study finds that competitively weaker electric utilities use more cost-inflating SFAS No. 106 assumptions, and show a greater tendency to refrain from benefit plan reductions. Both these choices increase accrued costs reported under SFAS No. 106.

Research on retiree benefit plan reductions among nonregulated firms (Mittelstaedt 1989; Thomas 1989; Mittelstaedt et al. 1995) shows that financially weak firms are more likely to terminate or reduce retiree benefit plans, possibly because their internally generated cash flows fall short of their requirements. In contrast, this study shows that competitively weak electric utilities are more likely to refrain from retiree benefit plan reductions following SFAS No. 106. Postponing benefit plan reductions enables these rate-regulated firms to frontload the recovery of retiree health costs in current rates. They stand to benefit from such a strategy (when benefit plan reductions or terminations occur at later dates) if regulators do not demand perfect *ex post* settlement, or if the industry is expected to move away from rate regulation in the future.

In summary, this paper contributes to two lines of accounting research: firm responses to mandated accounting changes, and the determinants of decisions to modify retiree benefit contracts. It extends both lines of research by focusing on an industry that is rate-regulated and consequently fosters a different alignment between managerial welfare and the nature of decisions made in response to a mandated accounting change.

Institutional Background

For much of the past century, electric utilities have been subject to rate regulation that allowed them to recover their service costs and to earn a permitted rate of return on invested capital. The advent of competition in the electric utility industry can be traced back to the Public Utilities Regulatory Policies Act of 1978 (PURPA), which encouraged the growth of nonutility power production. However, independent power producers were not permitted to contract directly with consumers or to sell outside the service territory of the host utility. The 1992 Energy Policy Act propelled the growth of competition in the generating sector. The Act removed the legal restrictions that prevented utilities from forming corporate subsidiaries that can produce and sell electric power at the wholesale level without regulatory restrictions. One of the most significant provisions of the Act gives the Federal Energy Regulatory Commission the authority to require a utility to provide other power suppliers

access to its transmission system for wholesale power sales across regional lines. The Act therefore greatly increased competitiveness in the industry (Standard & Poor's Corporation 1993).

Since the passage of the 1992 Energy Policy Act, many state legislatures began to consider "retail wheeling" (access to another utility's transmission system to transmit power to retail customers). As retail wheeling becomes a reality, utilities once sheltered by regulation will begin to face the threat of territorial invasion by neighboring utilities. Competitive realities will determine future rates in a deregulated environment, since the industry will no longer operate on a cost reimbursement basis.

The imminence of electric utility industry deregulation implies that the findings in this study are analogous to those of Thomas and Tung (1992). They show that defense contractors who have, or plan to have, nondefense business, tend to overfund pension plans when employees work on defense contracts (that operate on a cost reimbursement basis) and to withdraw excess pension assets when employees work on nondefense business.

III. RESEARCH DESIGN

Watts and Zimmerman (1990) point out the importance of analyzing the potential endogeneity in the choices made by firms along different dimensions. Treating endogenous variables as exogenous, or excluding relevant choice variables, leads to biased and inconsistent parameter estimates, and hence to potentially erroneous inferences. Analyzing accrual and transaction decisions made by banks to achieve their tax, earnings and regulatory goals, Beatty et al. (1995) demonstrate the importance of accounting for simultaneity. Consequently, this study employs a model that explicitly allows for simultaneity in the reporting and contracting responses of firms to SFAS No. 106.

If electric utilities respond to SFAS No. 106 by simultaneously selecting reporting and contracting strategies (say, Y_1 and Y_2 , respectively), the following system of equations captures their decision problem:

$$Y_1 = f(X_1, Y_2) \quad (1)$$

$$Y_2 = f(X_2, Y_1) \quad (2)$$

where X_1 and X_2 are arrays of exogenous variables determining each strategy. If equations (1) and (2) are estimated using ordinary least squares (OLS), parameter estimates will be biased and inconsistent because the equation errors are likely to be correlated with the explanatory variables. A two-stage estimation procedure must be used to yield unbiased and consistent parameter estimates. The first stage of the procedure consists of the following reduced form equation estimations:

$$Y_1 = \pi_1 X + v_1 \quad (3)$$

$$Y_2 = \pi_2 X + v_2 \quad (4)$$

where X represents the full set of exogenous variables in the system.

In the second stage of the estimation procedure, predicted values of Y_1 and Y_2 obtained from the reduced form equation estimations are used as "instruments" for their actual values when equations (1) and (2) are estimated. In a well-specified model, the instrumented endogenous variables will be uncorrelated with the equation errors, and parameter estimates

will be unbiased and consistent. If Y_1 and Y_2 were both continuous variables, OLS would be used for all estimations, and the procedure outlined above would correspond to a two-stage least squares (2SLS) estimation technique.

In this study, the dependent variable in the reporting strategy equation (Y_1) is continuous, but the dependent variable in the contracting strategy equation (Y_2) is dichotomous. In estimating the reduced form equations, I use OLS to estimate equation (3), but Probit to estimate equation (4). Because Y_2 is dichotomous, I can only estimate $\pi_2^* = \pi_2/\sigma_2$, where σ_2^2 is the variance of v_2 . Hence $Y_2^* = \pi_2^* X + v_2^*$, where v_2^* has unit variance. The structural equations are:

$$Y_1 = \gamma_1 \sigma_2 Y_2^* + \beta_1' X_1 + u_1. \quad (5)$$

$$Y_2^* = (\gamma_2/\sigma_2) Y_1 + (\beta_2/\sigma_2)' X_2 + u_2/\sigma_2. \quad (6)$$

In the second stage of the simultaneous estimation procedure, I estimate equations (5) and (6) by OLS and Probit, respectively, after substituting the fitted values of Y_1 and Y_2^* obtained by the OLS and Probit estimations of the respective reduced form equations in the first stage.⁵

The parameter estimates obtained through this procedure are consistent and unbiased, but the covariance matrices need to be adjusted. Nelson and Olson (1978) first suggested a two-stage estimation procedure for a system of equations in which one dependent variable is continuous and the other censored. Amemiya (1979) derived the covariance matrix for the Nelson-Olson estimator.⁶ Using a procedure similar to that used by Amemiya (1979) for the Nelson-Olson model, Maddala (1983) derived the covariance matrix for the estimator from a simultaneous system comprising one continuous and one dichotomous dependent variable.

If J_1 and J_2 are matrices consisting of ones and zeroes such that they extract from X the subsets of exogenous variables determining Y_1 and Y_2 , respectively, i.e.,

$$XJ_1 = X_1 \text{ and } XJ_2 = X_2;$$

$$H = (\pi_2^*, J_1);$$

$$G = (\pi_1, J_2).$$

V_0 is the covariance matrix from the reduced form Probit model;

$$c = \sigma_1^2 - 2\gamma_1\sigma_{12};$$

$$d = (\gamma_2/\sigma_2)^2\sigma_1^2 - 2(\gamma_2/\sigma_2)(\sigma_{12}/\sigma_2);$$

⁵ Stone and Rasp (1991) investigate the small sample properties of Logit (Probit) vs. OLS when the dependent variable is dichotomous. They demonstrate that in small samples, t-tests of individual variables are conservatively biased at conventional levels of significance when Logit (Probit) is used; however, tests of the overall Logit (Probit) model are anticonservatively biased. They conclude that, even though the Logit (Probit) test statistics may be modestly miscalibrated, these techniques are preferable to OLS even for sample sizes as small as 50.

⁶ Amemiya (1979) went on to prove the existence of GLS estimators that are more efficient than two-stage estimation procedures. Lee (1982) showed that there exist some generalized instrumental-variable estimators that are asymptotically more efficient than the estimators derived from Amemiya's (1979) principle.

$$\sigma_1^2 = \text{variance of } v_1;$$

$$\sigma_{12}/\sigma_2 = \text{covariance } (v_1, v_2^*);$$

then the corrected covariance matrices for the parameter estimates in equations (5) and (6) are given, respectively, by:

$$c(H'X'XH)^{-1} + (\gamma_1\sigma_2)^2 (H'X'XH)^{-1} H'X'XV_0X'XH(H'X'XH)^{-1};$$

and

$$(G'V_0^{-1}G)^{-1} + d(G'V_0^{-1}G)^{-1}G'V_0^{-1}(X'X)^{-1}V_0^{-1}G(G'V_0^{-1}G)^{-1}.$$

I estimate t-statistics associated with the parameter estimates in equations (5) and (6) by using both the unadjusted and the corrected covariance matrices.

IV. HYPOTHESIS DEVELOPMENT AND VARIABLE SPECIFICATION

Competitive Strength

The retail wheeling proposals that began to be considered by many state legislatures since the early 1990s are extending to retail markets the competitive forces that were set into motion in wholesale markets by the Energy Policy Act of 1992. Faced with the prospect of deregulation, electric utilities have incentives to use cost-inflating assumptions to frontload their SFAS No. 106 costs while their markets are, for the most part, still captive. The incentive to accelerate cost recoveries varies with the probability that these costs will not be recoverable in future rates in a deregulated regime. High-cost producers with more price-sensitive customer bases are competitively weaker, i.e., they face the greatest threat of future demand loss. I hypothesize that these competitively weak utilities will tend to use more cost-inflating assumptions.⁷

With the imminence of widespread competition, cost efficiency will become an economic imperative. Therefore, utilities have an economic incentive to downsize retiree benefit plans so as to reduce their commitments to retirees. However, the timing of their modification decision is important. The accrued SFAS No. 106 expense that is recovered in rates is significantly higher than pay-as-you-go costs for most electric utilities. Consequently, if utilities do not reduce benefit plans as long as the industry remains rate-regulated, they can frontload the expense, i.e., they can recover from current consumers (who constitute a still-captive market) a larger proportion of the costs they will eventually bear. Therefore, I argue that competitively weak utilities (i.e., those whose relatively high cost structure and dependence on a more price-sensitive customer base will render them more vulnerable in a deregulated environment) have greater incentives not to reduce employee benefit plans currently.

Competitive Strength: Operationalization

Analyzing the changing competitive climate in the electric utility industry, Standard & Poor's Corporation (1993, U27) states:

Those utilities with high average kilowatt hour (kwh) production costs and a significant industrial customer base will be most severely affected.

⁷ An assumption implicit in this argument is that the advantages of such a strategy will outweigh potential current costs such as demand loss from wholesale customers or loss through the relocation of industries.

Industry analysts generally agree that the key elements that determine the competitive position of an electric utility are its cost structure and degree of dependence on customers who have access to substitution alternatives. I therefore operationalize the competitive strength variable (COMP) on the basis of two measures averaged over the period 1990–1992: production costs per kilowatt-hour and the percentage of sales to industrial customers, as a percentage of corresponding averages for the competitive pool in which the utility operates.⁸ Competitive vulnerability hinges on joint exposure on both of these fronts, so I define COMP as the equally weighted average of these two percentages, with values of COMP greater (less) than 100 indicating more (less) vulnerability to competitive pressures.⁹

Regulatory Climate

The nature of the regulatory environment in which utilities operate is likely to be another determinant of their reporting strategies. Regulators will differ in the degree to which they scrutinize SFAS No. 106 cost estimates, or demand *ex post* settlement of differences between estimated and realized costs while utilities are under their purview. Regulators can also exhibit differences at the rate design level, by permitting, for instance, that a less price-elastic class of customers (e.g., residential) bear more of the incremental costs. Therefore, I expect utilities in more “favorable” regulatory jurisdictions to use more cost-inflating assumptions. Employee-related costs have always been a recognized cost of service component, so I do not expect the benefit plan modification decision to hinge on the regulatory climate in the jurisdiction.

Regulatory Climate: Operationalization

More than 20 Wall Street investment and research firms produce periodic rankings of the regulatory environment associated with different state public utility commissions. Since the main users of these rankings are potential investors in utility stocks, the highest rankings are assigned to those commissions most favorable to the utilities. Factors that bear on these rankings include: the return on equity allowed by the commission; the use of “original cost” or “fair value” in rate base determination; the use of historical, current or future test year in cost determination; allowance of construction work in progress (CWIP) in rate base; use of automatic fuel adjustment clauses; use of “normalized” vs. “flow through” accounting for taxes; and average lag between the filing and the settlement of rate cases.

I use data provided by Merrill Lynch (1991–1992), Duff & Phelps (1991–1992) and Goldman Sachs (1993) to compute a firm’s regulatory rating (REG) over the period 1991–1992. REG is constructed on a scale of 1 to 5, with 5 being the most favorable rating. Jurisdictional ratings are first averaged across the time period 1991–1992 for each analyst, and then averaged across analysts.¹⁰ Many electric utilities operate in more than one jurisdiction, so a weighted average of relevant jurisdictional ratings is used to compute REG.

⁸ Data on these variables are provided by Duff & Phelps (1993b). Interconnected regions within the North American Reliability Council, which encompasses virtually all the power systems of North America, define the competitive pool to which a utility belongs.

⁹ A weighted average specification along these lines was recently developed by Goldman Sachs (1996) to examine the competitive position of electric utilities. To provide a sensitivity measure, I also weight each component percentage inversely by its sample-wide, as well as within-pool, standard deviation. Results are robust to these alternate sets of weights.

¹⁰ Goldman Sachs ratings are available only for 1992. Duff & Phelps and Goldman Sachs ratings range from 1 to 5, with 1 the highest quality ranking. These ratings are recoded so that the highest is assigned a value of 5 and the lowest a value of 1 in conformance with Merrill Lynch. + (–) qualifiers are coded by adding 0.25 to (subtracting 0.25 from) the numerical rating. The correlations between analysts’ ratings are as follows: Merrill Lynch and Goldman Sachs: 0.73; Merrill Lynch and Duff & Phelps: 0.68; Goldman Sachs and Duff & Phelps: 0.63.

The proportion of revenues earned in each jurisdiction is used to form the weighted average.¹¹

Accounting Impact of SFAS No. 106

Regulators are generally resistant to rate shocks. In fact, Revsine (1985, 57) claims that regulators exhibit a “hedonistic” tendency to subsidize today’s consumer at the expense of tomorrow’s, possibly as a concession to political pressures. Utilities are, therefore, likely to be inhibited in their ability to use cost-inflating SFAS No. 106 assumptions if the accounting impact of SFAS No. 106 is high, i.e., if the accrued SFAS No. 106 expense (prior to the effect of reporting choices) is large relative to the pay-as-you-go costs that were previously being recovered in rates.

If the accounting impact of SFAS No. 106 is high, utilities are also more likely to reduce health benefit plans because of anticipated regulatory resistance to rate shocks. Also, higher accrued SFAS No. 106 costs indicate greater employee-related obligations to be met in the future, giving utilities an additional incentive to downsize retiree health benefit plans.

Accounting Impact of SFAS No. 106: Operationalization

The accrued SFAS No. 106 costs reported by firms in financial statements are a function both of the reporting choices made and of the plan modification decision. FASB requires that firms make sensitivity disclosures regarding their medical trend and discount rate assumptions. These disclosures can be used to back out the impact of reporting discretion from reported costs. However, I do not have adequate information to strip the effect of benefit plan modifications from reported SFAS No. 106 costs. Consequently, I do not use the accrued costs reported in financial statements as a measure of the accounting impact of SFAS No. 106. I use instead the ratio of active employees to retired employees covered by utilities’ health plans in 1990 to operationalize the accounting impact of SFAS No. 106 (IMP). The denominator of this ratio provides a measure of the firm’s pay-as-you costs, and the numerator captures accrued costs.¹² I construct IMP using information on health benefit plans provided by firms in their 1990 Internal Revenue Service Form 5500 filings (“Annual Return/Report of Employee Benefit Plan”).¹³

Union Power

The electric utility industry is relatively strongly unionized. Costs associated with benefit plan reductions include labor resistance as well as decreased competitiveness in the labor market. The bargaining power of the union is likely to be a significant factor in the benefit plan modification decision. Managements are expected to be less apt to downsize post-retirement benefits at utilities with more powerful unions.

Union Power: Operationalization

Union power is operationalized using a measure that attempts to capture historical bargaining leverage, as reflected in the cumulative effect of past bargaining agreements.¹⁴

¹¹ Revenue data are obtained from *Moody’s Public Utilities Manual* (Moody’s 1991). In a few cases, revenues earned in each jurisdiction are not directly available. The relative number of customers or counties served in each jurisdiction is then used as the weighting variable.

¹² Espahbodi et al. (1991) use the ratio of total retirees to current employees to measure the accounting impact of SFAS No. 106. They obtain data on the number of retirees through a survey of firms.

¹³ If more than one health plan is listed, I aggregate across plans to obtain the ratio of active-to-retired employees.

¹⁴ I also attempted to capture more recent issues in management-union dealings through two other variables: number of paid holidays as of 1992, and average annual across-the-board wage increases negotiated by the
(Continued on next page)

I use comparative wage levels as a measure of historical union strength. The variable WAGE is constructed to measure the ratio of 1992 hourly wages of unionized workers to the average 1992 hourly wages for comparable jobs in the same union district, in an attempt to control for geographic cost of living differences. The International Brotherhood of Electrical Workers (IBEW) operates in ten geographic districts. The contracts investigated in each district range across six types or departments (e.g., electric generation, distribution, clerical). IBEW lists three standard jobs within each contract type to facilitate comparability. As a first step, I compute 180 averages ($10 \times 6 \times 3$), corresponding to the 1992 average hourly wage for each district, department and job, to serve as yardsticks for comparison. Next I compute the ratio of 1992 hourly wages for each job within a contract to the corresponding district average. Ratios are then averaged across the different jobs within a contract, and a weighted average formed across different contracts (if more than one) pertaining to the same utility, based on the number of employees covered by each contract.

Proximity to Debt Covenant Violations

Amir and Gordon (1996) find that firms that are more highly leveraged are less likely to use cost-inflating SFAS No. 106 assumptions. Mittelstaedt et al. (1995) report that firms with higher levels of debt have a greater tendency to reduce retiree health benefits. These results are consistent with research that documents that nonregulated firms respond to accounting changes that increase recognized liabilities in ways calculated to avert costs associated with debt covenant violations. Unlike nonregulated firms that, for the most part recognized the SFAS No. 106 transition obligation immediately (see Amir and Livnat 1996), nearly all electric utilities opted for prospective recognition of the transition obligation. Consequently, the risk of debt covenant violations as a result of SFAS No. 106 adoption is likely to be much lower for electric utilities. They are, therefore, unlikely to take costly economic actions, such as employee contract modifications, merely to downplay reported liabilities.¹⁵ However, electric utilities whose creditworthiness is already suspect (as evidenced, for instance, by lower bond ratings) do have some incentives to reduce reported liabilities, in view of imminent industry deregulation. Therefore, I hypothesize that proximity to debt covenant violations will inhibit utilities' ability to use cost-inflating SFAS No. 106 assumptions.

Proximity to Debt Covenant Violations: Operationalization

I use Duff & Phelps' 1992 senior debt rating (Duff & Phelps 1993a) to operationalize proximity to debt covenant violations.¹⁶ This variable (BOND) is computed on a scale of 0 to 15, since there are 16 categories from the highest (AAA) to the lowest (B⁻) assigned to the utilities in the sample. A rating of B⁻ is coded as 0, and an AAA rating as 15. For a few firms in the sample, the consolidated entity is not rated by Duff & Phelps, but the

Footnote 14 (Continued)

union at each utility over the period 1990–1991. Neither of these variables was found to be significantly related to the benefit plan modification decision, nor did their exclusion alter any inferences. Consequently, I exclude them from the reported results. Data for all union-related variables are supplied by the International Brotherhood of Electrical Workers (IBEW), which represents a majority of electric utility workers in the country. I am grateful to Don Servatius, IBEW's Sixth District Office, Illinois, for giving me access to the union's internal records.

¹⁵ It is unclear whether technical covenant violations will lead debtholders to impose contracting costs on regulated firms, when these violations are accompanied by increases in firms' cash flows. D'Souza (1997) documents that, unlike the general population of firms, electric utilities with lower bond ratings, lower interest coverage ratios, and higher financial leverage ratios experienced a positive market reaction to early SFAS No. 106-related events.

¹⁶ Credit rating agencies such as Duff & Phelps, Standard & Poor's, Moody's, and Fitch rate individual bond issuances, and also give the utility an overall senior debt rating. Senior bonds in the industry have traditionally had long maturity periods, typically 30 years.

individual subsidiaries are. A weighted average is computed for the consolidated entity in these cases, based on the proportion of debt issued by each subsidiary.

Interdependence of Reporting and Contracting Strategies

Benefit reductions permanently reduce economic commitments. However, such reductions are costly, particularly in a strongly unionized industry. Inflating post-retirement benefit cost estimates may strengthen a firm's position in contract modification negotiations, thereby averting some of the potential costs associated with the modification decision.¹⁷ Utilities that use more inflated SFAS No. 106 cost estimates will therefore, *ceteris paribus*, find it less costly to modify benefit plans.

Cost-inflating SFAS No. 106 assumptions can help utilities to frontload the recovery of retiree benefit costs. At the same time, as accrued expenses rise, utilities face the risk of regulatory resistance to unacceptably high rate increases. Benefit plan reductions result in lower accrued SFAS No. 106 costs. Therefore, controlling for all other factors, utilities that reduce their benefit plans can better use more cost-inflating SFAS No. 106 assumptions.

Contracting and Reporting Strategies: Operationalization

The contracting strategy (MOD) is coded as a dichotomous variable: 1 if plan modifications occurred or were announced in the wake of SFAS No. 106, and 0 otherwise. The data are provided by Goldman, Sachs & Co., which produced a report at the end of 1992 on the post-retirement benefit-related responses to SFAS No. 106 of the 83 electric utilities the firm follows.¹⁸

I operationalize the SFAS No. 106 reporting strategy (PROJR) based on utilities' medical trend rate choice. In a field test study sponsored by the Financial Executives Research Foundation, Dankner et al. (1989) identify the medical trend and discount rate assumptions as having the most critical impact on accrued cost computations.¹⁹ However, electric utilities exhibit very little variance in their discount rate choice.²⁰ Consequently, I expect the medical trend choice to provide the most powerful test of strategic management of SFAS No. 106 costs. Even though the choice of the utility in this regard is observable, the FASB has not specified a benchmark against which to evaluate this choice. It is therefore likely that regulators will lack either the incentive or convincing evidence to contest medical trend choices within a "reasonable" range.²¹

¹⁷ Liberty and Zimmerman (1986) investigate the use of accounting numbers to influence contractual relationships with employees, but do not find any evidence to this effect. In their analysis of labor concessions in the domestic steel industry during the 1980s, DeAngelo and DeAngelo (1991) find significant evidence that reported losses "buttressed managers' case for union concessions."

¹⁸ Some details of these responses are summarized in panel A of table 4. I also looked at firms' Annual Report and 10-K disclosures related to post-retirement benefits from 1990 to 1994. Because most utilities that amended their plans did so prior to adopting SFAS No. 106 (which requires more disclosures), few provide information on plan amendments.

¹⁹ Actuarial assumptions such as employee turnover ratios and mortality rates also affect SFAS No. 106 cost estimates, although less powerfully than the medical trend and discount rate choices. These actuarial assumptions, though observable to regulators, are not required SFAS No. 106 disclosures and are unavailable in financial statements.

²⁰ The mean 1993 discount rate is 7.3 percent. For almost all utilities in my sample, the selected discount rate falls in the seven percent to eight percent range. Amir and Gordon (1996) report a similar lack of variability in the discount rate in their sample of firms across all industries. The lack of variability is probably attributable to the fact that the FASB has linked the discount rate choice to the long-term yield on high-quality securities. Also, companies cannot credibly deviate much from the discount rate in use for pension cost computations.

²¹ Anecdotal evidence suggests that auditors too do not contest "reasonable" estimates of medical trend choices used in financial statements. Steinberg et al. (1992) point out that determining what health care cost trend rates are reasonable can be particularly difficult for auditors.

The medical trend rate chosen by the utilities in my sample for 1994 averages 10.9 percent, but ranges from six percent to 15 percent. Some of the divergence in initial rates may be due to firm-specific factors such as differences in location. The distribution is more compact for utilities in the same jurisdiction, but considerable within-jurisdiction variance in the medical trend rate does exist. For instance, the 1994 medical trend rate chosen by the six New York utilities in my sample averages 9.98 percent, and ranges from 7.9 percent to 12.5 percent. It should be noted, however, that there is much less divergence in the "ultimate rate" choice (i.e., the rate at which inflation is expected to stabilize). This ranges from five percent to six percent for most utilities, although there is wide variance in the estimate of when the steady-state level will occur. Given the sensitivity of SFAS No. 106 cost estimates to the medical trend assumption (particularly in earlier years), the reporting discretion enjoyed by utilities leaves them with a great deal of leeway to manage reported costs.

PROJR is operationalized as follows. I obtain data on each firm's SFAS No. 106-related medical trend assumptions from its 1993 Annual Report. All the utilities in the sample use graded medical trends, with higher growth rates assumed in earlier years. I use the information in the financial statement footnote disclosures to define the gradation pattern over time. In the absence of further information, I assume a constant linear rate of decline, leading from the initial rate to the final rate within the specified time period.

The variable PROJR measures how much a dollar spent in 1993 for medical care would cost over the period 1994–2000, given the firm's reported medical trend assumptions for the period. For instance, if a utility chose a ten percent medical cost trend rate for 1994, a nine percent rate for 1995, and an eight percent rate for 1996 through 2000, every dollar spent in medical care in 1993 would be projected to cost \$1.10 in 1994, \$(1.10)(1.09) in 1995, \$(1.10)(1.09)(1.08) in 1996, and so on. Therefore, $PROJR = i_1 + i_1 \times i_2 + i_1 \times i_2 \times i_3 + \dots + i_1 \times i_2 \times i_3 \times i_4 \times i_5 \times i_6 \times i_7$, where $i_j = 1 +$ assumed medical cost trend for year j ($j = 1$ for 1994, 2 for 1995, ..., 7 for 2000).²²

Control Variable

Medical trend choices of utilities can differ because of differences in types of benefits offered and related inflation rates in the various regions where the utilities operate. The reporting strategy equation, therefore, needs a control variable to capture these differences. For each utility, I find the average annual increase in pay-as-you-go costs over the period 1988–1990 (y) from financial statement footnotes. I then construct a control variable, PROJP, to be comparable to the reporting choice variable, PROJR. PROJP thus captures how much a dollar spent for medical care in 1993 would cost over the period 1994–2000, assuming the annual inflation rate remains equal to the past trend, y , i.e., $PROJP = \sum_{t=1,7} (1 + y)^t$. Note that the formula for PROJP is identical to that for PROJR, except that the medical trend rate is now constant from year to year.

In summary, a more explicit version of the simultaneous model to be estimated is:

$$PROJR = f(MOD, COMP, REG, IMP, BOND, PROJP); \quad (7)$$

$$MOD = f(PROJR, COMP, IMP, WAGE). \quad (8)$$

²² The firms in my sample arrive at their final rates at different times. I chose the year 2000 as an arbitrary cutoff point. Since the specification of PROJR weights medical trend assumptions used in earlier years more heavily than those in subsequent years, not much additional information is derived from moving farther into the future. Amir and Gordon (1996) find that the first decade captures the medical trend choice as well as a 70-year horizon.

Sample Selection

The initial sample consisted of 83 electric utilities for which Goldman Sachs (1992) provided data on benefit plan modifications. Twenty-seven of these utilities were subsequently dropped from the sample because of missing data. Two utilities were dropped because they operate primarily in jurisdictions where rate recovery of accrued SFAS No. 106 costs has been denied, and one because it began accruing post-retirement benefit costs in the early 1980s. Five other utilities were added to the sample because benefit plan modification information was available in financial statement footnote disclosures, and data on all other required variables were available. The final sample size is 58.

V. RESULTS

Table 1 presents descriptive statistics for the variables used in the study. The mean COMP value of 98.51 suggests that the competitively stronger utilities in the sample slightly

TABLE 1
Descriptive Statistics of Firm Characteristics
(n = 58)

<i>Variable</i>	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>
REG	2.89	2.68	0.86
COMP	98.51	97.25	18.57
IMP	3.81	3.47	1.91
WAGE	1.02	1.02	0.08
BOND	10.06	10.00	2.16
PROJP	13.80	12.30	5.14
PROJR	10.22	10.24	0.60
MOD	0.50	0.50	0.50

REG = Firm regulatory environment rating over 1991–1992, on a scale of 1 to 5, with 5 being the environment most favorable to the utility.

COMP = Measure of competitive standing of each utility (lower values of COMP indicate a stronger competitive position). COMP reflects cost structure and elasticity of consumer demand for electric power.

IMP = Estimate of the accounting impact of SFAS No. 106, measured as the ratio of active employees to retirees covered by each utility's health plans.

WAGE = Estimate of union strength measured as the ratio of 1992 hourly wages of unionized utility workers to the average 1992 hourly wages for comparable jobs in the same union district. The ratios are averaged across different job categories within a contract, and a weighted average is then formed across different contracts (if any) pertaining to the same utility.

BOND = 1992 senior debt rating by Duff & Phelps, computed on a scale of 0 to 15. A B⁻ rating is assigned a value of 0 and an AAA rating a value of 15.

PROJP = Projected cost of a dollar's worth of medical care in 1993 through the period 1994–2000, given the average annual growth (y) in the utility's pay-as-you go post-retirement benefit costs over the period 1988–1990 = $\sum_{t=1,7} (1 + y)^t$.

PROJR = Projected cost of a dollar's worth of medical care in 1993 through the period 1994–2000, given the firm's medical trend assumptions for the period = $i_1 + i_1 \times i_2 + i_1 \times i_2 \times i_3 + \dots + i_1 \times i_2 \times i_3 \times i_4 \times i_5 \times i_6 \times i_7$, where $i_j = 1 +$ the firm's assumed medical trend for year j (j = 1 for 1994, 2 for 1995, ..., 7 for 2000).

MOD = Benefit plan modification decision (1 if plan modifications occurred/were announced by 1992; 0 otherwise).

outweigh the weaker ones (recall that COMP measures the utility's production costs and dependence on an industrial customer base as a percentage of the relative average for its competitive pool). The mean IMP value is 3.81, showing that accrued SFAS No. 106 costs are substantially higher than pay-as-you-go costs for the electric utility industry. It is interesting to note that the mean and median values of PROJP are both higher than corresponding values for PROJ. This indicates that either utilities did not expect the inflation rates prevailing in the late 1980s to be sustainable in the middle to late 1990s, or they anticipated that regulators would not view past trends as sustainable in the future.

Table 2 shows descriptive statistics for the total energy production costs per kilowatt-hour in the various North American Electric Reliability Council (NERC) regions. The intra-region cost differences are most pronounced for the Western, Mid-Atlantic, and East Central regions. In the Western region, for instance, the cost per kilowatt-hour for the highest-cost producer (5.64 cents) is more than three times that for the lowest-cost producer (1.76 cents). As electric utilities begin to compete with one another more directly, high-cost producers in these regions are expected to experience strong competitive pressures, particularly if they are heavily dependent on customers with greater access to substitution alternatives.²³

Table 3 shows Pearson product-moment correlations between variables. BOND is positively correlated with REG and negatively correlated with COMP, indicating that more favorable bond ratings are associated with more favorable regulatory jurisdictions and stronger competitive positions. Since the predisposition of regulators helps to determine the inherent riskiness of utilities under their jurisdiction, the positive correlation between REG and BOND is not surprising.

The negative correlation between COMP and MOD is in line with the hypothesis that competitively weaker utilities will frontload retiree benefit costs by refraining from benefit plan modifications. PROJ and BOND are positively correlated, consistent with the hypothesis that lower bond ratings constrain a utility's ability to use cost-inflating SFAS No. 106 assumptions.

The correlation between PROJ and PROJP, though positive, is not statistically significant. One possible explanation for this is that PROJP is an imperfect proxy for the "true" component of PROJ and is likely to be negatively correlated with its strategic component.

Panel A of table 4 shows the various types of benefit plan modifications implemented or planned by electric utilities. Caps on employer subsidies, increased employee contributions, and more limited eligibility for coverage are the most frequently reported modifications. If the benefit plan modification decision has a direct negative impact on future medical trend rates, this direct effect may obscure the indirect positive relationship hypothesized to exist between PROJ and MOD, and introduce a bias toward the null.

Panel B of table 4 investigates the extent of this potential problem, by comparing the distribution of PROJ for plan modifiers vs. nonmodifiers. With the exception of the minimum value of PROJ, which is lower for the nonmodifier group, the values of PROJ are higher if benefit plans have not been modified. However, these differences are not statistically significant, as indicated by the Kruskal-Wallis test (Mosteller and Rourke 1973). The lack of significance of the PROJ differences between plan modifiers and nonmodifiers alleviates, to some extent, the concern that there might be a strong enough direct relation between MOD and PROJ to obscure the strategic relation that is hypothesized to exist between them.

²³ Since utilities within each NERC region are already interconnected, these regions form a logical starting point for defining a utility's competitive pool. Eventually, however, infrastructures may develop that will facilitate competition across regions. Also, the competitive strength variable should ideally include a component to capture each utility's excess capacity or ability to expand production to meet increased demand.

TABLE 2
Descriptive Statistics for Energy Costs by NERC Region*

<i>Descriptive Statistics for NERC Regional Energy Costs (Data, in cents per KWH, averaged over the period 1990–92)</i>							
<i>Region</i>	<i>N</i>	<i>Max</i>	<i>Q3</i>	<i>Median</i>	<i>Q1</i>	<i>Min</i>	<i>Std. Dev.</i>
ECAR	30	5.95	3.75	2.84	2.34	1.82	1.04
ERCOT	10	4.65	3.72	3.48	2.87	2.32	0.76
MAAC	13	6.01	5.08	3.90	3.46	2.47	1.10
MAIN	12	4.66	3.07	2.84	2.56	2.29	0.71
MAPP	14	3.30	2.81	2.32	2.26	1.64	0.45
NPCC	17	5.94	4.95	4.33	4.03	3.82	0.66
SERC	15	4.02	3.59	3.33	2.64	2.40	0.51
SPP	12	4.27	3.69	3.35	2.66	2.47	0.62
WSCC	20	5.64	4.66	3.18	2.31	1.76	1.35

* NERC = North American Electric Reliability Council;
 ECAR = East Central Area Reliability Coordination Agreement;
 ERCOT = Electric Reliability Council of Texas;
 MAAC = Mid-Atlantic Area Council;
 MAIN = Mid-America Interconnected Network;
 MAPP = Mid-Continent Area Power Pool;
 NPCC = Northeast Power Coordinating Council;
 SERC = Southeastern Electric Reliability Council;
 SPP = Southwest Power Pool;
 WSCC = Western Systems Coordinating Council.

Table 5 presents the results of the simultaneous model estimation, and table 6 shows the results obtained when the reporting and contracting strategies are separately estimated, using OLS and Probit, respectively. Panel A of each table presents results for the reporting strategy estimation, and panel B for the contracting strategy estimation.

Specification Issues

Hausman (1978) popularized a testing methodology for comparing two alternative estimators, when one is unbiased, consistent and efficient under the null (but biased and inconsistent under the alternative), and the second is unbiased and consistent under both the null and the alternative, but is inefficient under the null. The rationale for the Hausman (1978) test is that if the null is true, both estimators should produce similar estimates; however, if the null is false, the two sets of estimates should differ. The Hausman (1978) test is therefore a test of the equality of the parameter estimates produced by the two estimators. The test statistic (based on the difference between the two sets of parameters and the inverse of the difference between their variance-covariance matrices) is distributed as a Chi-square with degrees of freedom equal to the number of parameters estimated. It is often impractical to operationalize this version of the Hausman (1978) test, either because the difference between the estimated variance-covariance matrices cannot be easily inverted, or because the variance-covariance matrix estimates are such that the diagonal elements of the matrix difference turn out to have negative signs.

TABLE 3
Pearson Product-Moment Correlations Between Independent Variables
(n = 58)

	<i>COMP</i>	<i>IMP</i>	<i>WAGE</i>	<i>BOND</i>	<i>PROJP</i>	<i>PROJR</i>	<i>MOD</i>
REG	-0.34 (0.00)	0.20 (0.14)	-0.02 (0.91)	0.42 (0.00)	0.08 (0.53)	0.13 (0.34)	0.19 (0.16)
COMP		0.01 (0.94)	-0.07 (0.60)	-0.23 (0.08)	-0.02 (0.89)	0.12 (0.35)	-0.30 (0.02)
IMP			0.06 (0.65)	-0.15 (0.27)	-0.10 (0.45)	-0.19 (0.16)	0.07 (0.60)
WAGE				0.15 (0.25)	0.01 (0.96)	-0.15 (0.26)	-0.16 (0.23)
BOND					0.08 (0.55)	0.39 (0.00)	0.10 (0.46)
PROJP						0.16 (0.23)	-0.00 (0.98)
PROJR							-0.20 (0.14)

All variables are defined in table 1.

A variant of the Hausman (1978) test, called the "omitted variables" version of the test, is often used to avoid the problems described above (see Spencer and Berk 1981; Kennedy 1992).²⁴ In the relatively simple case represented by a comparison of the simultaneous and independent estimations of equations (7) and (8), the omitted variables variant of the Hausman (1978) test entails expanding the right-hand variables of the two equations to include both the instrumented and the actual values of MOD (PROJR), and testing for the significance of the t-statistics on the instrumented variables. If the null hypothesis of no endogeneity is true, the instrumented variables should have no incremental explanatory power in these equations that also include the original variables that are hypothesized to be non-endogenous. Significant t-statistics on the instrumented variables thus indicate a rejection of the null hypothesis of no endogeneity, and imply that failure to account for endogeneity may lead to biased and inconsistent estimates.

A null hypothesis of no endogeneity can be erroneously rejected if the equations are incorrectly specified. Hausman (1983) proposes a statistic to determine if there are exogenous variables in the system that have been incorrectly omitted from the equation being examined. The Hausman check for over-identifying restrictions tests the correlation between the residuals from the second-stage estimation and the entire set of exogenous variables by computing a Chi-square statistic based on the Lagrange multiplier principle (the degrees of freedom of this Chi-square statistic equals the number of over-identifying restrictions in the equation). Rejection of the test for over-identifying restrictions implies that a simultaneous estimation procedure is inappropriate even if the null hypothesis of no endogeneity is rejected.

²⁴ Beatty et al. (1995) use this version of the Hausman (1978) test to compare independent and simultaneous estimations.

TABLE 4
Benefit Plan Modifications and Their Potential Impact on Electric Utilities' Medical Trend Rate Choice

Panel A: Types of Changes in Post-Retirement Benefit Plans (n = 31)*

<i>Change in Benefit Design</i>	<i>Number of Companies</i>
Reduction in benefit levels	3
Elimination of benefits for at least some employees	3
Dollar caps on employer subsidies	9
Increase in employee contributions	7
More limited eligibility for coverage	7
Introduction of cost management approaches such as managed care	6

Panel B: Descriptive Statistics for PROJ R for Benefit Plan Modifiers vs. Nonmodifiers

	<i>MOD=1 (Modifiers; n=29)</i>	<i>MOD=0 (Nonmodifiers; n=29)</i>
PROJ R		
Minimum	9.25	8.89
Q1	9.80	9.83
Median	10.15	10.44
Mean	10.15	10.28
Q3	10.60	10.80
Maximum	10.86	11.65

Kruskal-Wallis Test for mean equality: χ^2 -statistic: 1.02 (1 df); $\text{Prob}(\chi^2 > 1.02) = 0.31$.

* Data obtained from Goldman Sachs (1992). The number of changes (35) is greater than the number of modifying firms (31) because of multiple types of changes by some firms. My sample comprises 29 (instead of 31) modifiers because of incomplete data for two firms.

Godfrey and Hutton (1994) reiterate the importance of conducting the test for over-identifying restrictions prior to testing for endogeneity. They show that the two tests are independent, so that the significance levels of the endogeneity tests are free from pretest biases.

I compare results from the simultaneous and independent estimations of the contracting and reporting equations in tables 5 and 6, with the appropriate tests for overidentifying restrictions and for endogeneity.

Results of Simultaneous and Independent Estimations of Reporting and Contracting Choices

Reporting Strategy Model

Panel A, table 5, reports the results of the reporting choice equation, when the reporting and contracting choices are assumed to be simultaneously determined. Panel A, table 6, presents the results obtained when the reporting equation is modeled as if MOD were an

TABLE 5
Two-Stage Least Squares Estimates for the Two-Equation System with the Firm's Contracting and Reporting Decisions as Endogenous Variables
(n = 58)

Panel A: Second Stage Estimates of the Reporting Choice Equation

<i>Independent Variables (predicted sign)</i>	<i>Dependent Variable PROJR</i>			
	<i>Coefficient</i>	<i>2nd Stage t-statistic</i>	<i>Adjusted t-statistic</i>	<i>p-value^a (adj. t-statistic)</i>
MOD (+)	0.439	1.85	1.25	0.10
COMP (+)	0.017	2.72	1.88	0.03
REG (+)	-0.052	-0.52	-0.37	0.65
BOND (+)	0.121	3.42	2.44	0.01
IMP (-)	-0.069	-1.77	-1.26	0.10
PROJP (+)	0.026	1.98	1.41	0.08

$R^2 = 0.36$

F-statistic: 4.85; Prob ($F > 4.85$) = 0.000

Panel B: Second Stage Estimates of the Contracting Choice Equation

<i>Independent Variables (predicted sign)</i>	<i>Dependent Variable MOD</i>			
	<i>Coefficient</i>	<i>2nd Stage t-statistic</i>	<i>Adjusted t-statistic</i>	<i>p-value^a (adj. t-statistic)</i>
PROJR (+)	0.270	0.49	0.49	0.31
COMP (-)	-0.025	-2.45	-2.44	0.01
WAGE (-)	-3.340	-1.31	-1.29	0.09
IMP (+)	0.077	0.78	0.77	0.22

Goodness-of-fit-test:

Model χ^2 -statistic: 8.59 (df = 4); Prob ($\chi^2 > 8.59$) = 0.07

χ^2 test of no overidentifying restrictions:^b

χ^2 -statistic: 0.25 (df = 2); Prob ($\chi^2 > 0.25$) = 0.88

^a t-statistic p-values are for one-tailed tests

^b This χ^2 statistic is computed as the product of the sample size and coefficient of determination (nR^2) from the regression of the second-stage estimation residuals on the full set of exogenous variables.

All variables are defined in table 1.

exogenous variable. If the assumption of exogeneity is correct, the coefficients from both estimations are unbiased and consistent, and should, therefore, not differ significantly from one another, although the OLS estimation will be more efficient. The coefficients of MOD and REG have opposite signs, and the magnitudes of the COMP and IMP coefficients differ

TABLE 6
Independent Estimations of the Reporting and Contracting Choice Equations
(n = 58)

Panel A: OLS Estimation of the Reporting Choice Equation

<i>Independent Variables</i> <i>(predicted sign)</i>	<i>Dependent Variable PROJR</i>		
	<i>Coefficient</i>	<i>t-statistic</i>	<i>p-value^a</i>
MOD (+)	-0.091	-0.637	0.736
COMP (+)	0.007	1.753	0.043
REG (+)	0.010	0.103	0.459
BOND (+)	0.123	3.382	0.001
IMP (-)	-0.048	-1.243	0.110
PROJP (+)	0.025	1.856	0.035

$R^2 = 0.33$

F-statistic: 4.11; Prob ($F > 4.11$) = 0.002

Test of null hypothesis of exogeneity of MOD:^b

t-statistic: 2.35; Prob ($|t| > 2.35$) = 0.02

Panel B: Probit Estimation of the Contracting Choice Equation

<i>Independent Variables</i> <i>(predicted sign)</i>	<i>Dependent Variable MOD</i>		
	<i>Coefficient</i>	<i>t-statistic</i>	<i>p-value^a</i>
PROJR (+)	-0.195	-0.65	0.78
COMP (-)	-0.024	-2.34	0.01
WAGE (-)	-3.873	-1.55	0.06
IMP (+)	0.042	0.46	0.33

Goodness-of-fit test:

Model χ^2 -statistic: 8.77 (df = 4); Prob ($\chi^2 > 8.77$) = 0.07

Test of null hypothesis of exogeneity of PROJR:^b

t-statistic: 1.03; Prob ($|t| > 1.03$) = 0.30

^a t-statistic p-values are for one-tailed tests.

^b The exogeneity of MOD(PROJR) is tested through the t-statistic on the predicted value of MOD(PROJR) (obtained from the first stage of the estimation procedure), when this predicted value is added as a right-hand-side variable, along with the actual value of MOD(PROJR), in the equation with PROJR(MOD) as the dependent variable.

All variables are defined in table 1.

across the two estimations. The OLS estimation suggests no relation between PROJR and MOD, but the simultaneous estimation offers some evidence of a relation in the hypothesized direction. Other inferences remain essentially unchanged across the two specifications.

I formally test the appropriateness of the simultaneous specification through an endogeneity test. (Recall that this test involves adding the instrumented value of MOD to the

OLS specification and testing the significance of the t-statistic on the instrumented variable.) The null hypothesis that MOD is exogenous is rejected (results reported in panel A of table 6), offering evidence that the simultaneous specification is more appropriate.²⁵

Under the simultaneous specification, the second-stage estimation of the reporting strategy model is significant at the 0.000 level (panel A, table 5). The t-statistics from the second-stage estimation are deflated by about 33 percent when I use the covariance matrix derived in Maddala (1983) instead of the standard errors from the second stage.

The coefficient of MOD in panel A of table 5 is positive, as hypothesized, although the significance level is not high. This provides some modest support for the hypothesis that benefit plan modifications give utilities more opportunities to use cost-inflating SFAS No. 106 assumptions.

The coefficient of COMP is significantly positive. This supports the argument that weaker utilities, which face more uncertainty about their future environment, have greater incentives to respond to an expense-increasing accounting standard in ways that enhance reported expenses. It contrasts with findings that weaker nonregulated firms have greater incentives to respond to an expense-increasing accounting standard in ways that offset the financial statement impact of the standard.

The coefficient of REG is statistically insignificant, indicating no evidence that utilities' reporting choices are influenced by their regulatory environment. It is possible that the relation between PROJ and REG is not linear or constant, so I re-estimate the model converting REG to a dichotomous variable equal to 1 if its previous value exceeded 3, and 0 otherwise. Results remain essentially unchanged.

BOND measures utilities' credit ratings; lower BOND values suggest a greater probability that contracting costs could be imposed by bondholders if covenants are violated. The positive BOND coefficient supports the hypothesis that utilities with lower bond ratings are constrained in their ability to inflate SFAS No. 106 cost estimates. These results are consistent with those documented by Amir and Gordon (1996). Costs associated with debt covenant violations are likely to increase with the imminence of deregulation in the electric utility industry, introducing incentives similar to those documented for nonregulated enterprises.

As hypothesized, the coefficient of IMP is negative, implying that utilities for which the accounting impact of SFAS No. 106 is high are less able to use cost-inflating SFAS No. 106 assumptions. The coefficient on the control variable, PROJP, is positive as expected.

Contracting Strategy Model

Results of the contracting strategy equation under the simultaneous and independent specifications are presented in panel B of tables 5 and 6. The coefficients of PROJ have opposite signs in the two specifications, and there are also differences in the magnitudes of some of the other parameter estimates. Since the Chi-square test of no over-identifying restrictions is not rejected (table 5, panel B), I test the null hypothesis that PROJ is exogenous. Results (reported in table 6, panel B) indicate that the null hypothesis of exogeneity cannot be rejected.²⁶

²⁵ Note that the reporting strategy equation is exactly identified because there is only one exogenous variable (WAGE) excluded from it, and therefore available to instrument MOD (see equations (7) and (8)). This obviates the need for the test of over-identifying restrictions.

²⁶ Failure to reject the null hypothesis is also consistent with the explanation that the reduced form equation with PROJ as the dependent variable does not provide a good instrument for this variable. However, the adjusted R^2 of the first-stage estimation with PROJ as dependent variable (not reported) is 0.29 and the significance level of the model F-statistic is 0.000.

Inferences drawn are essentially the same under both specifications.²⁷ Results do not indicate that the contracting choice is significantly influenced either by the level of discretion exercised in the reporting choice or by the accounting impact of SFAS No. 106. However, I do find some support for the union power hypothesis. Utilities where unionized workers have traditionally enjoyed more bargaining power show a greater tendency to refrain from benefit plan modifications.

My results strongly support the competitive weakness hypothesis. The coefficient of COMP is significantly negative, indicating that competitively weak utilities are less apt to reduce post-retirement benefit plan commitments. These results are especially interesting in contrast to those documented for nonregulated firms by Mittelstaedt et al. (1995), who find that financially weaker firms are more likely to reduce retiree health care plans. The cash flow consequences of plan reductions are distinctly different for regulated and non-regulated firms: benefit reductions curtail cash outflows for the latter, but decrease net cash inflows for the former. My results are consistent with the argument that electric utilities that will be most vulnerable in a deregulated environment have the most incentive to recover as much of their future costs as possible while they are still operating in a regulated regime. In general, these findings support the notion that rate-regulated firms that face greater future risks react to an expense-increasing accounting standard in ways that intensify the impact of the accounting change on current financial statements.

VI. CONCLUSION

This study extends existing research by investigating firm responses to mandated accounting changes in an industry that is rate-regulated. Expense-increasing accounting standards generally have no direct cash flow consequences for nonregulated firms, but they reduce these firms' reported net income and increase their reported liabilities. Past research documents that managers of nonregulated firms seek to avert potential contracting costs associated with the mandated accounting change through operating, financing or reporting decisions that mitigate the financial statement impact of the accounting change. In contrast, expense-increasing accounting standards generally have no impact on rate-regulated firms' net income, but do have a positive effect on these firms' cash flows because the rate recovery mechanism is based on accounting numbers. Managers of rate-regulated firms thus have incentives to respond to expense-increasing accounting standards in ways that enhance the financial statement impact of the accounting change. This study documents that managerial incentives to use discretionary choices to intensify the current financial statement impact of expense-increasing accounting changes is larger for rate-regulated firms that face greater uncertainties about future rate recoveries. Specifically, I find that competitively weaker utilities tend to use more cost-inflating SFAS No. 106 assumptions and to refrain from retiree health care plan reductions. Both these discretionary choices increase accrued costs reported under SFAS No. 106.

This study contributes to two lines of accounting research: the economic consequences of accounting standards, and the determinants of retiree benefit plan modifications. It augments both branches of research because it documents that the unique characteristics of the rate-regulated environment precipitate managerial responses to an expense-increasing accounting change that differ from those documented for nonregulated firms.

I use a simultaneous estimation procedure to capture the likelihood that utilities' discretionary choices in response to SFAS No. 106 are jointly determined. I find some evidence

²⁷ Note that adjustment of the covariance matrix for the second stage of the simultaneous estimation leaves the *t*-statistics virtually unchanged for this equation.

that utilities that reduce health care benefits use more cost-inflating assumptions. Reduced economic commitments give utilities more reporting flexibility. Also, higher cost estimates can serve as a bargaining tool in labor negotiations. However, I do not find evidence that a utility's reporting choice is a significant determinant of its contracting decision.

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BOOK REVIEWS

Thomas H. Williams, Editor

Editor's Note: Two copies of books for review should be sent to Professor Thomas H. Williams, McIntire School of Commerce, University of Virginia, Charlottesville, VA 22903-2493. The policy of *The Accounting Review* is to publish only those reviews solicited by the Book Review Editor. Unsolicited reviews will not be accepted.

TIMOTHY BELL, FRANK MARRS, IRA SOLOMON, AND HOWARD THOMAS, *Auditing Organizations Through a Strategic-System Lens* (Montvale, NJ: KPMG Peat Marwick LLP, 1997, pp. xi, 86).

The authors, two from KPMG Peat Marwick and two from the University of Illinois (including the KPMG Peat Marwick Professor), develop a compelling argument for a new approach to the external audit. This monograph is a "must read" for everyone interested in auditing because it:

- describes the theoretical basis for the audit approach of a major international firm;
- develops a framework for classroom presentation focusing on strategic management of the organization; and
- identifies a number of assumptions that are clearly "testable," thereby providing a rich source of ideas for potential research.

In a foreword to the book, Professor Bill Kinney writes that the monograph contains a number of "we believe" statements and he concludes that a major contribution of the monograph is that it "can lead to thoughtful research by scholars and practitioners." After having read the book, I believe that Professor Kinney is correct—the monograph can be the source of a rich research program that can lead to the improvement of auditing.

The authors develop the case that traditional auditing has been too narrow (they refer to it as the reductionist approach) and argue that the focus on transactions and accounting treatments often obscures the underlying economic rationale for the transactions and the processes for generating value. The strategic lens approach, in contrast, focuses the auditor's attention on the organization's business strategy, risks, controls, monitoring procedures, connections to outside economic agents, and internal forces that threaten the viability of its chosen riches. The basic argument is that the auditor should focus on assertions at the entity level, e.g., viability of the organization, sustainable growth, or joint entity relations. The entity level focus promises "greater power to detect material misstatements as they allow the auditor to ground key judgments in a critical and holistic understanding of the client's systems dynamics" (12).

The monograph is organized around eight short chapters:

1. Introduction
2. Current Authoritative Guidance About the Need to Understand the Client's Business and Industry
3. Overview of the Evolution of Auditing Practices
4. Assessing Audit Risk Through a Strategic-Systems Lens
5. The Global Business Environment
6. A Proposed Knowledge Acquisition Framework for the Risk-Based Strategic-Systems Audit
7. The KPMG Business Measurement Process
8. Business Models, KPI's Expectations, and Audit Evidence
9. Concluding Comments

Chapter 2 examines existing audit guidance on obtaining knowledge of the client's business and concludes that important questions are unanswered. The most important are:

- What knowledge is needed and to what level of the client's business should the auditor direct his attention?
- How much knowledge about the client's business and industry is needed?
- What is the relative importance of this business knowledge to the auditor's opinion, compared to the knowledge obtained about individual transactions?

The remaining chapters attempt to answer these questions by building a business systems model. Clearly, the monograph answers the third question; i.e., business knowledge is the critical element to conducting an audit. The reader will have to decide for him or herself whether the first two questions are adequately answered. I found the monograph presented a framework for answering the first two questions. However, it left me short of understanding how the information was to be integrated into the normal audit beyond that which is done in a risk-based approach to auditing. I would urge those who teach auditing to ask a KMPG partner into class to demonstrate the practical implementation of the audit approach.

The monograph is important also because it subtly introduces concepts that seem to be accepted by today's auditors, but which represent significant deviations from traditional audit practice. For example, the following assumptions are made:

- The audit should be designed to "provide valuable, independent feedback to the organization's board of directors, upper management, and business process owners (internally) on (a) entity level performance, (b) structural strengths and weaknesses, (c) business process strengths and weaknesses, and (d) its current strategic positioning and possible vulnerabilities related to emerging trends (62).
- There should be a greater emphasis on assessing inherent risk (66).
- Assessing the quality of earnings should be an integral part of the audit (53).

These are important assumptions. For example, the ASOBAC (1972) definition of auditing focuses on communicating information about economic events to third parties. The reporting model is expanded here, perhaps rightfully so, to include communication beyond that required by today's auditing standards to the entity itself. It is argued that the auditor can fulfill this role because he is like a painter, i.e., the auditor adds value because of an objective, entity-wide view of the organization gained during the audit. There is likely little argument that most large auditing firms are pushing such reporting. It would seem that research on the value of the expanded feedback, the cost of generating the feedback, and the possible implications for the traditional audit objective would be useful.

The richness of the monograph is offset by aspects of presentation that detracted from the overall message. First, chapter 4 develops Beer's Hierarchy of Components of a Viable System. However, the linkage between this model and the other models developed later is not always clear. Second, there is a tendency to develop "straw men"; e.g., the traditional audit approach or the traditional business risk control paradigms, and then use the straw men to make points about the new approach. Third, it is not clear when something is a control or a strategy. For example, is "implementing growth and opportunity plans for employees" a control or a strategy? Finally, the monograph is rich with examples, but basic questions such as how many core processes—and at what depth—need to be examined.

Notwithstanding these difficulties, I recommend the monograph to anyone interested in research in this area. There are a number of rich questions that should be addressed by researchers. As an example, the following questions seem pertinent:

- The monograph criticizes the traditional audit approach because of biases introduced by the sampling approach. However, it is unclear what biases may be embedded into the strategic lens approach or what constitutes sufficient evidence.
- Research shows that auditors, as well as most humans, are not good at predicting situations that are unlike current situations. Yet, that ability is fundamental to gathering evidence and evaluating assertions using the strategic lens approach. Is there something about the strategic lens approach that makes auditors better at making such predictions? For example, I wonder if the strategic approach would have found the Equity Funding fraud. The monograph would argue that it would have been more effective than the traditional approach.
- The authors argue that the approach allows the auditor to gather *expert knowledge* (69) and integrate that knowledge into *valid and defensible conclusions*. Consensus on what constitutes expert knowledge and valid and defensible conclusions would be useful.
- Chapter 8 introduces Key Performance Indicators (KPI's). Future research to identify these KPI's for specific business processes or industries will be helpful.

- The strategic lens audit approach requires the auditor to develop expectations about overall financial performance and, therefore, financial statement presentation. More specifically, the authors assert "these knowledge-laden expectations form the basis of a new breed of analytical procedures that hold promise for highly effective audits." Previous research sponsored by KPMG cited the importance of analytical techniques in identifying misstatements, but subsequent research raised questions about the adequacy of analytical procedures used only by themselves. The monograph provides a potential explanation to these anomalous results; analytical techniques are enhanced by human judgement. Decision-making research on (1) identifying the best information for developing expectations; and (2) understanding how auditors utilize the information for decision-making will be useful.

In summary, the monograph lays out an important new approach to conducting audits and, in the process, makes fundamental assumptions about the nature of auditing and the audit product. The material contained therein is important and should be read by anyone interested in teaching or practicing auditing or performing audit research.

LARRY E. RITTENBERG
Professor of Accounting

University of Wisconsin-Madison

ROGER Y. W. TANG, *Intrafirm Trade and Global Transfer Pricing Regulation* (Westport, CT: Quorum Books, 1997, pp. xvii, 262, Hb \$75).

The operating units of a multinational enterprise routinely engage in a wide range of intrafirm transactions. Vertically integrated manufacturers, for example, frequently acquire raw materials and component parts from foreign affiliates, and then market and distribute their end-products overseas through foreign branches or subsidiaries. A domestic affiliate may license its patents, trademarks, copyrights, secret processes, or other manufacturing and marketing intangibles to its foreign affiliates for exploitation abroad. One affiliate may supply debt capital to its foreign affiliates, or it may provide those affiliates with technical know-how or managerial and administrative services.

Cross-border transactions between related entities or between departments or divisions of a single entity (transactions collectively referred to as "intrafirm trade") are not inherently problematic. Indeed, as Professor Tang observes, they are integral to the conduct of a multinational business enterprise. In 1996, about 40 percent (\$500 billion) of U.S. foreign trade and 20 percent (\$2 trillion) of world trade was intrafirm trade and this volume has been increasing rapidly.

From a tax and accounting perspective, however, intrafirm trade is distinguished by the absence of the free market forces that can usually be relied upon to establish bona fide market values in transactions between unrelated parties, and by the consequent necessity of crafting and assigning surrogate values. Although transfer prices do not affect total enterprise income, they do determine how that total income is allocated between the transacting affiliates and, frequently, the timing of its recognition. Given the often substantial differences in relative tax burdens imposed by various countries, this creates an enormous potential for tax avoidance through the assignment of transfer prices that do not comport with economic reality.

Assume, for example, that a U.S. manufacturer (subject to a 35 percent U.S. income tax rate) exports its manufactured inventory to its wholly owned German subsidiary (subject to a 45 percent German income tax rate) for distribution and sale throughout the European Union. During the current year, the U.S. parent earned an arms-length profit of \$100 million on sales to its German subsidiary and that the subsidiary earned an additional \$100 million profit as a result of wholesaling these goods in the EU. On these facts, the combined income tax liability for the current year would be \$80 million. But in a world without constraint, the German taxes could have been permanently avoided and the U.S. taxes deferred indefinitely. The U.S. parent could have moved its entire manufacturing profit on the exported inventory offshore—and beyond the immediate reach of U.S. taxing authorities—by first forming a subsidiary in the Cayman Islands (where the income tax rate is 0 percent) and then by selling its inventory to that subsidiary at cost. Likewise, the German subsidiary could have moved its distribution profit offshore to the Cayman subsidiary by purchasing the inventory from that subsidiary for an amount equal to its ultimate resale price.

Most developed nations, the United States foremost among them, have developed and implemented "transfer pricing" rules (among others) to address the problem. Professor Tang's new book, his fourth on this subject, summarizes and explains the transfer pricing regulations issued by the U.S. taxing authorities and by those of many of its major trading partners around the world (Canada, Mexico, the United Kingdom, Germany, Italy, France, the

Netherlands, Japan, Australia, South Korea and China). The author observes that, although national rules vary widely in both scope and application, the international standard for transfer pricing is the "arm's length standard," i.e., the transfer price used by the related parties should be one that most accurately depicts the amount of consideration that would have been charged in the same transaction between unrelated parties dealing at arm's length.

The book opens with an examination of the growth in foreign direct investment and intrafirm trade that has taken place since 1970 and of the many environmental factors that have fueled this growth. Chapter 1 also identifies the major stakeholders in the formulation of transfer pricing policies and regulations. Chapter 2 focuses on the major issues and trends related to the intrafirm trade of U.S. multinational companies and summarizes recent literature on the subject.

Chapters 3 and 4 are devoted to a review of the current U.S. transfer pricing regime. Chapter 3 summarizes and explains the current regulations under Section 482, the final cost-sharing regulations, and the 20 and 40 percent accuracy related penalties of Section 6662. Chapter 4 focuses on the various programs and procedures that are designed to reduce uncertainties (advance pricing agreements or "APAs") and to resolve transfer pricing controversies (competent authority procedure and transfer pricing arbitration).

In chapter 5, Professor Tang discusses, in considerable detail, the transfer pricing reports and guidelines issued by the Organization for Economic Cooperation and Development (OECD) in 1979, 1984, 1993 and 1995. Chapters 6 through 8 present summaries of the levels of foreign direct investment and intrafirm trade between the U.S. and each of several selected countries within North America (chapter 6), Europe (chapter 7), and the Asian Pacific Rim (chapter 8) and reviews their respective transfer pricing regulations and administrative programs. The author concludes with a chapter devoted to summarizing major research findings in each of several areas pertaining to intrafirm trade and transfer pricing and to suggesting a new paradigm for avoiding and resolving many related problems and issues. Each chapter is accompanied by an extensive bibliography. The book's five appendices reproduce some of the transfer pricing rules and regulations of the U.S., Canada, the U.K. (these rules have been substantially revised since this book was published) and China.

Given the dramatic increase in international intrafirm trade and widespread concern over transfer pricing issues (the author cites a 1995 Ernst and Young study in which 82 percent of the 210 respondent multinational corporations from eight countries considered transfer pricing to be the most important international tax issue facing multinationals), the rich background and informed perspective provided by Professor Tang is both timely and relevant. The book is a logically organized, well-written, and detailed introduction to a complex, multi-dimensional topic.

DAVID W. LARUE
Associate Professor

University of Virginia

BOOKS RECEIVED FEBRUARY 1, 1998 TO APRIL 15, 1998

- PHILIP W. BELL, ed., *Toward Greater Logic and Utility in Accounting: The Collected Writings of Philip W. Bell* (New York: Garland Publishing, Inc., 1997, xxxvi, 450, Hb).
- HUGH COOMBS, JOHN RICHARD EDWARDS, and HUGH GREENER, eds., *Double Entry Bookkeeping in British Central Government, 1822-1856* (New York: Garland Publishing, Inc., 1997, ix, 349, Hb).
- TIMOTHY S. DOUPNIK, ed., *Advances in International Accounting*, Vol. 10, (Greenwich, CT: JAI Press, Inc., 1997, viii, 253, Hb \$78.50).
- JOHN HOLLAND, *Corporate Communications with Institutional Shareholders: Private Disclosures and Financial Reporting* (Edinburgh: The Institute of Chartered Accountants of Scotland, 1997, x, 88, Pb £15.00).
- THOMAS A. LEE and PETER W. WOLNIZER, eds., *The Quest for a Science of Accounting: An Anthology of the Research of Robert R. Sterling* (New York: Garland Publishing, Inc., 1997, xlviii, 803, Hb).
- RICHARD MATTESSICH, *Critique of Accounting: Examination of the Foundations and Normative Structure of an Applied Discipline* (Westport, CT: Greenwood Publishing Group, 1995, xix, 284, Hb \$65).
- LARRY M. PARKER, ed., *Research in Accounting Regulation, Special Tenth Anniversary International Edition, Supplement 1*, 1997 (Greenwich, CT: JAI Press, Inc., 1997, x, 417, Hb \$78.50).
- LAWRENCE A. PONEMON, ed., *Research on Accounting Ethics*, Vol. 3, (Greenwich, CT: JAI Press, Inc., 1997, xiii, 334, Hb \$78.50).
- THOMAS A. PORCANO, ed., *Advances in Taxation*, Vol. 9, (Greenwich, CT: JAI Press, Inc., 1997, xiv, 199, Hb \$78.50).
- GARY JOHN PREVITS, ed., *Research in Accounting Regulation*, Vol. 11, (Greenwich, CT: JAI Press, Inc., 1997, xi, 259, Hb \$78.50).
- ALFRED RAPPAPORT, *Creating Shareholder Value*, Revised Edition (New York: The Free Press, 1998, xviii, 205, Hb \$35).

- PHILIP M. J. RECKERS, ed., *Advances in Accounting*, Vol. 15 (Greenwich, CT: JAI Press Inc., 1997, xvi, 300, Hb \$78.50).
- WAYMOND RODGERS, *Throughput Modeling: Financial Information Used by Decision Makers* (Greenwich, CT: JAI Press Inc., 1997, xvii, 210, Hb \$78.50).
- J. B. RYAN and C. T. HEAZLEWOOD, eds., *Accounting Research Study No. 14, Australian Company Financial Reporting: 1997* (Caulfield: Australian Accounting Research Foundation, 1997, xxiv, 376, Pb).
- STEVE C. SUTTON, ed., *Advances in Accounting Information Systems*, Vol. 5, (Greenwich, CT: JAI Press, Inc., 1997, xii, 300, Hb \$78.50).

Editorial Data

Manuscripts submitted to *The Accounting Review* are assigned two reviewers. The following table contains information about turnaround time for reviewed manuscripts for the 12-month period ended February 28, 1998. Turnaround time is the number of days between the date of the editor's letter to the author(s) and the date that the manuscript and submission fee were received:

	<u>Number of Manuscripts</u>	<u>Cumulative Number</u>	<u>Cumulative Percent</u>
$0 \leq \text{Days} \leq 30$	5	5	2.2
$31 \leq \text{Days} \leq 60$	41	46	20.6
$61 \leq \text{Days} \leq 90$	127	173	77.6
$91 \leq \text{Days} \leq 120$	45	218	97.8
$121 \leq \text{Days}$	5	223	100.0

The mean and median review times were about 78 days. A limited number of manuscripts are returned without review and such manuscripts are excluded from the turnaround time statistics reported above.

EDITORIAL POLICY AND STYLE INFORMATION

EDITORIAL POLICY

According to the policies set by the Publications Committee (which were endorsed by the Executive Committee and were published in the *Accounting Education News*, June 1987), *The Accounting Review* "should be viewed as the premier journal for publishing articles reporting the results of accounting research and explaining and illustrating related research methodology. The scope of acceptable articles should embrace any research methodology and any accounting-related subject, as long as the articles meet the standards established for publication in the journal....No special sections should be necessary. The primary, but not exclusive, audience should be—as it is now—academicians, graduate students, and others interested in accounting research."

The primary criterion for publication in *The Accounting Review* is the significance of the contribution an article makes to the literature.

The efficiency and effectiveness of the editorial review process is critically dependent upon the actions of both authors submitting papers and the reviewers. Authors accept the responsibility of preparing research papers at a level suitable for evaluation by independent reviewers. Such preparation, therefore, should include subjecting the manuscript to critique by colleagues and others and revising it accordingly prior to submission. The review process is not to be used as a means of obtaining feedback at early stages of developing the research.

Reviewers and associate editors are responsible for providing critically constructive and prompt evaluations of submitted research papers based on the significance of their contribution and on the rigor of analysis and presentation. Associate editors also make editorial recommendations to the editor.

MANUSCRIPT PREPARATION AND STYLE

The Accounting Review's manuscript preparation guidelines follow (with a slight modification) the B-format of the *Chicago Manual of Style* (14th ed.; University of Chicago Press). Another helpful guide to usage and style is *The Elements of Style*, by William Strunk, Jr., and E. B. White (Macmillan). Spelling follows *Webster's International Dictionary*.

FORMAT

1. All manuscripts should be typed on one side of 8½ x 11" good quality paper and be double spaced, except for indented quotations.
2. Manuscripts should be as concise as the subject and research method permit, generally not to exceed 7,000 words.
3. Margins of at least one inch from top, bottom and sides should facilitate editing and duplication.
4. To assure anonymous review, authors should not identify themselves directly or indirectly in their papers. Single authors should not use the editorial "we."
5. A cover page should show the title of the paper, the author's name, title and affiliation, any acknowledgments, and a footnote indicating whether the author would be willing to share the data (see last paragraph in this statement).

Pagination: All pages, including tables, appendices and references, should be serially numbered. The first section of the paper should be untitled and unnumbered. Major sections may be numbered in Roman numerals. Subsections should not be numbered.

Numbers: Spell out numbers from one to ten, except when used in tables and lists, and when used with mathematical, statistical, scientific, or technical units and quantities, such as distances, weights and measures. For example: *three days*; *3 kilometers*; *30 years*. All other numbers are expressed numerically.

Percentages and Decimal Fractions: In nontechnical copy use the word percent in the text.

Hyphens: Use a hyphen to join unit modifiers or to clarify usage. For example: *a well-presented analysis*; *re-form*. See *Webster's* for correct usage.

Key Words: The abstract is to be followed by four key words that will assist in indexing the paper.

ABSTRACT/INTRODUCTION

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THE ACCOUNTING REVIEW

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Using Analysts' Forecasts to Measure Properties of Analysts' Information Environment

Orie E. Barron

Pennsylvania State University

Oliver Kim

University of Maryland

Steve C. Lim

Long Island University—C. W. Post

Douglas E. Stevens

University of New Hampshire and University of Arizona

ABSTRACT: This paper presents a model that relates properties of the analysts' information environment to the properties of their forecasts. First, we express forecast dispersion and error in the mean forecast in terms of analyst uncertainty and consensus (that is, the degree to which analysts share a common belief). Second, we reverse the relations to show how uncertainty and consensus can be measured by combining forecast dispersion, error in the mean forecast, and the number of forecasts. Third, we show that the quality of common and private information available to analysts can be measured using these same observable variables. The relations we present are intuitive and easily applied in empirical studies.

Key Words: *Analysts' forecasts, Uncertainty, Consensus, The quality of common and private information.*

I. INTRODUCTION

Empirical accounting research frequently relies on analyst forecasts to construct proxies for variables of interest. For example, the error in the mean forecast is used as a proxy for earnings surprise (e.g., Brown et al. 1987; Bamber and Cheon 1995;

This paper is a merger of three prior working papers by Barron and Kim, Barron and Stevens, and Lim. We gratefully acknowledge the help of Terry O'Keefe and the comments of our anonymous reviewers. We also acknowledge helpful comments from Jeff Abarbanell, Steve Baginski, Linda Bamber, Franklin Fant, Charles Kile, Mary Harris and Pamela Stuerke, as well as from workshop participants at Indiana University, the University of Nebraska, the University of New Hampshire and Temple University.

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Wiedman 1996; Bamber et al. 1997). In addition, forecast dispersion (that is, cross-sectional variance) and error in the mean forecast is used to proxy for the uncertainty or the degree of consensus among analysts or market participants (e.g., Daley et al. 1988; Ziebart 1990; Imhoff and Lobo 1992; Lang and Lundholm 1996; Barron and Stuerke 1997). However, the relation between these commonly used empirical proxies and such theoretical properties of the information environment as uncertainty and consensus has yet to be rigorously specified. This article investigates, from an analytical perspective, what the forecasts of analysts reveal about the properties of their information environment. We base our analysis on a model of expectations in which each analyst observes two signals about future earnings, one public (common across all analysts) and one private (idiosyncratic). The model demonstrates how these two different types of information result in forecast errors and dispersion and how the underlying unobservable characteristics of the analysts' information environment are revealed by expressions involving observable constructs.

The intuition underlying our main results stems from the fact that forecast dispersion and error relate in different ways to the common and idiosyncratic components of error in analysts' forecasts. The common error component arises from error in the public information analysts rely upon and the idiosyncratic error component arises from error in the private information analysts rely upon. We find that forecast dispersion reflects only idiosyncratic error. By contrast, error in individual forecasts reflects both common and idiosyncratic error and error in the mean forecast reflects primarily common error but may also reflect idiosyncratic error that is incompletely diversified away when only a limited number of forecasts exist.

The fact that errors in common vs. private information influence forecast dispersion and error differently yields insights into how certain theoretical properties of the *analysts'* information environment are reflected in empirical forecast measures *on average*. One can understand these insights best by referring to two theoretical constructs: uncertainty and consensus. "Uncertainty" refers to the expected squared error in individual forecasts aggregated (or averaged) across analysts. "Consensus" refers to the degree to which analysts share a common belief.¹ As we demonstrate, the expected dispersion in forecasts is an increasing function of uncertainty but a decreasing function of consensus, while the expected squared error in the mean forecast is an increasing function of both uncertainty and consensus. These findings provide guidance on how to construct valid measures of uncertainty and consensus from widely available earnings forecast (and realization) data.

This article is related to prior studies focused on the use of analyst forecasts to infer characteristics of investors' information environment (e.g., Barry and Jennings 1992; Abarbanell et al. 1995). Abarbanell, Lanen and Verrecchia (1995) (hereafter ALV) modeled the relation between analyst forecasts and investor beliefs and analyzed its implications for price and volume reactions to earnings surprises. Our study extends ALV by modeling the information analysts use to make forecasts. While the earnings forecasts in ALV's model are exogenously determined, the forecasts in our model are endogenously determined by the common and idiosyncratic information analysts use. This extension allows us to demonstrate how analyst forecasts reveal underlying characteristics of their information such as the precision (or quality) of common and private information.²

We have organized the rest of this article as follows. In section II, we outline our model and describe two properties of analysts' information environment—namely, the level of

¹ This consensus construct is a generalized version of the consensus construct Holthausen and Verrecchia (1990, 199) introduced.

² A more detailed description of the difference between our model and the models in ALV (1995) and Barry and Jennings (1992) appears in section II.

uncertainty and the degree of consensus among analysts. We show how expected forecast dispersion and error in the mean forecast are functions of uncertainty, consensus and the number of forecasts. We then reverse these relations and express uncertainty and consensus as functions of forecast dispersion, error, and the number of forecasts. We also show how one can express the precision (or quality) of analysts' common or private information as a function of these same observable measures. In section III, we discuss important issues related to interpreting and applying the model. Section IV includes some concluding remarks.

II. THE MODEL

This section presents a model of how financial analysts' earnings forecasts are related to their information environment—that is, to the general properties of their information and beliefs. We consider a firm for which N financial analysts forecast earnings. We denote the earnings that analysts forecast by y .³ It is assumed that y is normally distributed with mean $\bar{y}$ and precision (inverse of variance) h . Each analyst's available information about earnings consists of common (public) and idiosyncratic (private) information. The common information is represented by the common prior (with mean $\bar{y}$ and precision h). The private information of analyst i is represented by a signal $z_i = y + \epsilon_i$. This information is private in the sense that z_i is observed only by analyst i and that ϵ_i is distributed independently of all other variables. We assume that ϵ_i is normally distributed with mean zero and precision s_i . We allow s_i s to differ among analysts. That is, analysts' private information can be of differential quality.

The information environment of the N analysts described above is quite general under the assumption of normally distributed and additive errors. For example, consider two analysts with any finite number of differing signals (with one additive error term each) about y . The error terms of the signals can be correlated in any way. Still, one can show that each analyst's belief can be represented by one common signal (the prior) and one idiosyncratic signal as in our model. The only strong assumption is that common information between any two analysts is common among all analysts.

We assume that analyst i 's earnings forecast is his or her best estimate of earnings based on available information.⁴ As is well known, the conditional expectation is a weighted average of the common and private information available at the time of forming the expectation, with the precision of each as the weight. That is, analyst i 's forecast, denoted by μ_i , is defined by:

$$\mu_i \equiv E[y|z_i] = \frac{h\bar{y} + s_i z_i}{h + s_i}. \quad (1)$$

We define the mean forecast, denoted by μ , as:

$$\mu \equiv \frac{1}{N} \sum_{i=1}^N \mu_i = \frac{1}{N} \sum_{i=1}^N \frac{h\bar{y} + s_i z_i}{h + s_i}. \quad (2)$$

³ The primitive random variable in our model is earnings, under the assumption that analysts' earnings forecasts are strictly forecasts of *earnings*. Thus, information in our model is information about earnings to be disclosed in the near future, and not directly about the firm's future prospects (liquidating dividends).

⁴ The implications of this assumption, in light of analysts' tendencies to issue optimistic earnings forecasts are discussed in section III.

Thus, we define observed dispersion in forecasts, denoted by d , as the sample variance of the μ_i s, i.e.,⁵

$$d = \frac{1}{N-1} \sum_{i=1}^N (\mu_i - \mu)^2. \quad (3)$$

The sample variance, d , is itself a random variable prior to observing forecasts. Our non-random dispersion measure, denoted by D , is simply the unconditional expectation of d , i.e.,

$$D = E[d] = \frac{1}{N-1} \sum_{i=1}^N \text{Var}(\mu_i - \mu), \quad (4)$$

where the equality holds because the mean of $\mu_i - \mu$ is zero.

The observed error in the mean forecast, denoted by e , is the actual earnings minus the mean forecast, i.e.,

$$e = y - \mu. \quad (5)$$

Our measure of error in the mean forecast, denoted by SE , is the expectation of the squared error in the mean forecast, i.e.,

$$SE = E[e^2] = E[(y - \mu)^2]. \quad (6)$$

The variables D , SE and N represent the three observable variables in this model.⁶

We can now introduce two general properties of the analysts' information environment. Later in this section we show that, along with the number of forecasts, these two properties determine forecast dispersion and error in the mean forecast. The first property is the level of residual uncertainty. We first define the level of uncertainty for analyst i , denoted by V_i , as:

$$V_i = E[(y - \mu_i)^2] = \frac{1}{h + s_i}, \quad (7)$$

which is analyst i 's expected variance of y , conditional on his or her available information. We define the overall uncertainty level, V , as simply individual uncertainty averaged over N analysts, i.e.,

$$V = \frac{1}{N} \sum_{i=1}^N V_i = \frac{1}{N} \sum_{i=1}^N \frac{1}{h + s_i}. \quad (8)$$

The second measure we introduce is the degree of consensus among analysts. Our

⁵ Dispersion in forecasts is sometimes viewed as a population variance rather than a sample variance. In this case the denominator in equations (3) and (4) would be N rather than $N-1$. If this alternative definition of D in equation (4) is labeled D' then our later formulas can be converted to this alternative view by replacing D with $D'N/(N-1)$.

⁶ In section III we discuss the implication of treating expected dispersion and error in the mean forecast (D and SE) as observable when applying our model in empirical studies.

consensus measure, denoted by ρ , is the same as that introduced by Holthausen and Verrecchia (1990, 1999) except that it is generalized to our model with differential precision (that is, with different s_i s among analysts). We first define the average pair-wise covariance among analysts' beliefs, denoted by C , as:

$$C \equiv \frac{1}{N} \sum_{i=1}^N C_i = \frac{1}{N} \sum_{i=1}^N \left[\frac{1}{N-1} \sum_{j \neq i}^N \text{Cov}(y_i - \mu_i, y_j - \mu_j) \right], \quad (9)$$

where C_i is the average covariance between the beliefs of analyst i and the beliefs of the rest of the analysts. One can interpret the average covariance, C , as common uncertainty—that is, uncertainty shared by all analysts attributable to their reliance on imprecise common information. Consensus, ρ , is defined by:

$$\rho \equiv \frac{C}{V}. \quad (10)$$

Consensus is the degree to which the analysts' beliefs covary relative to the overall level of uncertainty, or the ratio of common uncertainty to the overall uncertainty. Stated differently, consensus measures how much the average (mean) belief reflects common vs. private information. When all available information is public, all analysts' beliefs are identical and $\rho = 1$. As h approaches zero, common information becomes so imprecise that analysts do not rely on it at all and their individual beliefs diverge more from the average belief as ρ approaches zero. In appendix B we show that our consensus measure ρ effectively summarizes two sources of information asymmetry: the ratio of private to total information and the degree to which individual uncertainty differs among analysts.

In the following lemma we first state relations among four variance-covariance measures defined earlier—namely, forecast dispersion and the (expected squared) error in the mean forecast, D and SE , uncertainty, V and average covariance, C . The proof appears in appendix A.

Lemma 1

$$V = C + D \quad (11)$$

and

$$SE = C + \frac{D}{N}. \quad (12)$$

Understanding lemma 1 is critical because our main results (Propositions 1 and 2) follow from lemma 1. Equation (11) shows that overall uncertainty, V , is simply the sum of the average covariance, C and expected dispersion, D . C is the uncertainty common to all analysts, so equation (11) implies that expected dispersion, D , reflects only the idiosyncratic uncertainty among analysts.

Equation (12) shows that the error in the mean forecast reflects common uncertainty, C , and a fraction of idiosyncratic uncertainty. Equation (12) also indicates that idiosyncratic uncertainty is diversified from the mean forecast. In other words, error contained in the

analysts' forecasts attributable to idiosyncratic information tends to cancel out in the mean forecast. When $N = 1$, no diversification occurs and the expected forecast error fully reflects overall uncertainty and coincides with V . As N grows large, the expected magnitude of error in the mean forecast reflects only common uncertainty.

In the following proposition, we express forecast dispersion and error as functions of uncertainty and consensus. The proof follows from lemma 1.

Proposition 1: Expected forecast dispersion, D and expected squared error in the mean forecast, SE , can be expressed as:

$$D = V - C = V(1 - \rho) \quad (13)$$

and

$$SE = \frac{V + (N - 1)C}{N} = V \left(\rho + \frac{1 - \rho}{N} \right) \quad (14)$$

where V , C and ρ are measures of overall uncertainty, common uncertainty and consensus, respectively, and N is the number of forecasts.

Proposition 1 shows that forecast dispersion and error in the mean forecast reflect uncertainty and consensus in a simple way. From equation (13), dispersion is an increasing function of uncertainty, V and a decreasing function of consensus, ρ . This result is consistent with the intuition of studies that use forecast dispersion as a proxy for uncertainty or lack of consensus. From equation (14), error in the mean forecast is an increasing function of both uncertainty and consensus. Proposition 1 leads to Proposition 2, which shows how one can use analyst forecasts to measure uncertainty and consensus more precisely than in previous studies.

Before moving to Proposition 2, we should discuss two analytical papers closely related to Proposition 1. In a similar setting, Barry and Jennings (1992), showed forecast dispersion to be affected by both uncertainty and information asymmetry as in equation (13). Barry and Jennings (1992) did not, however, examine error in the mean forecast in conjunction with forecast dispersion, which is a critical feature of our model. ALV analyzed a model in which forecasts were exogenously specified and arrived at some conclusions qualitatively similar to ours. However, the exogenous nature of the forecasts in their model creates subtle but important differences between their results and ours. For example, ALV suggested that forecast dispersion indicates a lack of precision in the mean forecast. Equation (13) suggests, however, that forecast dispersion can be caused by low levels of consensus, which equation (14) suggests can be associated with a *decrease* in the error in the mean forecast.⁷

The distinguishing feature of our model lies in the next proposition, in which we reverse the relations in Proposition 1 and express uncertainty, V , and consensus, ρ , in terms of D and SE .

Proposition 2: Uncertainty and consensus can be expressed as:

⁷ We present a more formal discussion of the difference between ALV (1995) and our model at the end of section II.

$$V = \left(1 - \frac{1}{N}\right) D + SE \quad (15)$$

and

$$\rho = \frac{SE - \frac{D}{N}}{\left(1 - \frac{1}{N}\right) D + SE} \quad (16)$$

Proposition 2, our main result, shows how one can infer uncertainty and consensus from observable forecast dispersion, error in the mean forecast and the number of forecasts. In a situation where the assumptions of our model reasonably apply, Proposition 2 provides concrete measures of total uncertainty and consensus among analysts. The simultaneous examination of dual measures, V and ρ , of the information environment is important in situations where information consists of both common and idiosyncratic elements.

We now examine the special case in which all analysts' private information is of equal precision—that is, $s_i = s$ for all i . This special case is easy to apply and is appropriate if financial analysts are all relatively well informed, with little difference existing in the quality of information available to them.⁸

Proposition 3: When analysts' private information is of equal precision, the following relations hold in addition to those of Proposition 2:

$$V = \frac{1}{h + s}, \quad \rho = \frac{h}{h + s} \quad (17, 18)$$

and

$$D = \frac{s}{(h + s)^2}, \quad SE = \frac{h + \frac{s}{N}}{(h + s)^2} \quad (19, 20)$$

Proposition 3 shows how the precision of public and private information relates to information characteristics and to forecast measures in this special case. Note from equation (18) that consensus is the ratio of the precision of common information to the sum of the precisions of common and private information. This means that the relative degree of consensus among analysts depends upon the relative precision of the common information available to them.⁹ From this result, one can express the primitive information parameters, h and s , directly in terms of D and SE .

⁸ Most empirical tests for differences in the magnitude of forecast error across analysts have failed to find significant differences. For example, O'Brien (1987), Coggin and Hunter (1989), O'Brien (1990) and Butler and Lang (1991) failed to find statistically significant differences in forecast accuracy across analysts. Sinha et al. (1997) did find statistically significant differences in accuracy after controlling for forecast recency. However, expected differences in the magnitude of forecast error across analysts (that is, differential uncertainty) may be economically insignificant, because these differences have been relatively difficult to detect.

⁹ See appendix B for the general relation between consensus and the common-to-total information ratio when differences in the quality of analysts' information exist.

Corollary 1: When analysts' private information is of equal precision, the following relations hold:

$$h = \frac{SE - \frac{D}{N}}{\left[\left(1 - \frac{1}{N} \right) D + SE \right]^2}, \quad (21)$$

and

$$s = \frac{D}{\left[\left(1 - \frac{1}{N} \right) D + SE \right]^2}. \quad (22)$$

Corollary 1 allows a researcher to obtain separate estimates of the precision of the common and private information incorporated into analysts' forecasts.

At this point the difference between our model and ALV can be described in more detail. The major difference in the two models is that ALV assume an exogenous individual forecast with two error terms, one common and one idiosyncratic (that is, they defined each forecast as $f_i = y + \delta + \eta_i$), while we derive an individual forecast from information signals, one common and one private. To emphasize this difference in the two models, assume that no differences exist in the precision of private information among analysts. Then, an individual forecast in our model is written in a form similar to that ALV used, $\mu_i = (h\bar{y} + sz_i)/(h + s) = y + h(\bar{y} - y)/(h + s) + se_i/(h + s)$. Here the terms $h(\bar{y} - y)/(h + s)$ and $se_i/(h + s)$ correspond to the terms δ and η_i , respectively. In ALV the variance of these two error terms, g^{-1} and m^{-1} , can take any values because they are exogenous, while in our model the two corresponding terms have variances $h/(h + s)^2$ and $s/(h + s)^2$, respectively, and are related to each other. This difference arises from the exogenous nature of forecasts in ALV and leads the two models to have different implications. For example, note that as the number of analysts, N , approaches infinity as in ALV, the two variances $h/(h + s)^2$ and $s/(h + s)^2$ are SE and D , respectively, from Proposition 3. In ALV forecast dispersion, $s/(h + s)^2$, is independent of the variance of the common error term, $h/(h + s)^2$, because they are assumed to be independent exogenous variables. In our model, however, the link between forecast dispersion and error in the mean forecast ($s/(h + s)^2$ and $h/(h + s)^2$ in this special case) through h or s is central to the results we obtain. Therefore, our model and its implications can be viewed as an important extension of ALV that endogenizes analysts' forecasts.

III. ISSUES RELATED TO INTERPRETING AND APPLYING THE MODEL

In this section we address some issues regarding both the interpretation and application of our model. These issues are particularly important for researchers wanting to use the model in empirical studies.

In the model, it is assumed that forecasts reflect the information analysts possess in an unbiased way. Prior research suggests, however, that analysts' incentives and strategic concerns can influence their forecasts (see for example, Dugar and Nathan 1995; McNichols and O'Brien 1997). The tendency of analysts to issue optimistic forecasts has the potential to confound the construct validity of some of the measures derived in the previous section.

Because bias inflates the expected magnitude of error in forecasts, it inflates estimates of uncertainty unless the bias is measured and removed. Ignoring bias could also inflate or deflate consensus estimates, depending on the extent to which bias is commonly shared or varies across analysts. Whether a researcher should attempt to obtain estimates of sample-wide bias or firm-specific bias in any particular application based upon our model is likely to depend upon context. We do note, however, that recent research suggests that bias in analysts' forecasts has decreased markedly in recent years, with optimistic bias in quarterly earnings forecasts having disappeared as of 1993 for S&P 500 firms (Brown 1996, 1997).

The tendency of analysts to "herd" (Trueman 1994) may also have an impact on the construct validity of the empirical forecast measures derived from our model. Herding occurs when analysts observe certain actions (for example, forecast revisions) of other analysts and then publish new forecasts influenced primarily by these observations. The distinction between primitive public and private information sources is clouded if some analysts use other analysts' forecasts as an information source. The impact of herding behavior on the construct validity of the measures developed in our model is an open issue.

Our main results depict unconditional expectations of forecast dispersion and error in the mean forecast (D and SE). Using our model in empirical contexts, therefore, will require the pooling of observations to measure dispersion and error in the mean forecast. Averaging over multiple observations will reduce measurement error and lead to measures with greater construct validity.

Despite some limitations and caveats, our model can be used in a variety of empirical studies. For example, Byard (1998) used the measures of common and private information precision described in this article to show that private information contributes 56 percent of the total precision of information available to analysts immediately prior to annual earnings announcements, up from 20 percent one year prior to the announcement. Furthermore, Byard (1998) found that large firms exhibit lower pre-announcement uncertainty and lower consensus than do small firms. Botosan and Harris (1997) used the consensus measure described in this article to examine the impact of managerial decisions to increase segment disclosure frequency. They hypothesized and found evidence to suggest that managers are more likely to provide quarterly segment data when consensus among analysts is low. In addition, firms initiating quarterly segment reporting experience an immediate and sustained increase in consensus among analysts.¹⁰ These papers suggest that the measures developed in this paper can open new avenues to understanding the joint roles of common and private information in capital markets.

IV. CONCLUSION

In this article we show how empirical researchers can use observable forecast dispersion and error in the mean forecast to understand important properties of analysts' information environment. We base our analysis on a simple model in which published forecasts are determined by common information (common to all analysts) and idiosyncratic information. Nevertheless, we believe that this study can serve as a practical guide for future research.

A significant gap exists between the information environment constructs found in theory and the empirical forecast-based proxies used to test theory. We narrow this gap by suggesting empirical forecast measures that more accurately reflect underlying theoretical constructs. For research using forecast data to improve, theoretical and empirical researchers

¹⁰ See Barron et al. (1998) for another example of a study that uses our model to study the quality of financial disclosures.

must strive for a common vocabulary. For example, we recommend that the term "consensus" refer only to the degree to which the average belief is commonly shared. The average forecast is often referred to as the "consensus forecast," regardless of whether it is commonly shared. Researchers have also used the term "consensus" in reference to forecast dispersion, even though dispersion reflects both uncertainty and a lack of consensus.

One can use the model described here to better understand the usefulness of financial reports to analysts, and to the extent that analysts' earnings forecasts reflect investors' beliefs, we may also achieve a clearer understanding of the usefulness of these reports to investors. This "forecast approach" for assessing the utility or impact of financial reports can be used as an alternative to or in conjunction with the traditional "market approach." Since the two approaches are subject to different limitations, together they can improve our understanding of the usefulness of accounting information and the determinants of the market reaction to the release of accounting information.

APPENDIX A

Proof of Lemma 1:

Let $e_i \equiv y - \mu_i$ for $i = 1, \dots, N$. Then:

$$\begin{aligned}
 D &= \frac{1}{N-1} \sum_{i=1}^N \text{Var} \left[e_i - \frac{1}{N} \sum_{j=1}^N e_j \right] \\
 &= \frac{1}{(N-1)N^2} \sum_{i=1}^N \text{Var} \left[Ne_i - \sum_{j=1}^N e_j \right] \\
 &= \frac{1}{(N-1)N^2} \sum_{i=1}^N \text{Var} \left[\sum_{j \neq i}^N (e_i - e_j) \right] \\
 &= \frac{1}{(N-1)N^2} \sum_{i=1}^N \left[(N-1)^2 V_i + \sum_{j \neq i}^N V_j - 2(N-1) \sum_{j \neq i}^N \text{Cov}(e_i, e_j) + \sum_{j \neq i}^N \sum_{k \neq i, j}^N \text{Cov}(e_j, e_k) \right] \\
 &= \frac{1}{(N-1)N^2} \sum_{i=1}^N \left[\{(N-1)^2 + (N-1)\} V_i + \{-2(N-1) + (N-2)\} \sum_{j \neq i}^N \text{Cov}(e_i, e_j) \right] \\
 &= \frac{1}{N} \sum_{i=1}^N V_i - \frac{1}{N} \sum_{i=1}^N \frac{1}{N-1} \sum_{j \neq i}^N \text{Cov}(e_i, e_j) \\
 &= V - C.
 \end{aligned}$$

Also, the (expected squared) error in the mean forecast, SE, can be written as:

$$\begin{aligned}
 SE &= \text{Var} \left[\frac{1}{N} \sum_{i=1}^N e_i \right] \\
 &= \frac{1}{N^2} \left[\sum_{i=1}^N V_i + \sum_{i=1}^N \sum_{j \neq i}^N \text{Cov}(e_i, e_j) \right] \\
 &= \frac{V}{N} + \frac{(N-1)C}{N} \\
 &= C + \frac{V-C}{N} \\
 &= C + \frac{D}{N}.
 \end{aligned}$$

APPENDIX B

Consider two sources of information asymmetry among analysts. First, analysts' beliefs differ according to the presence of private information, a situation captured by (1 minus) the average common-to-total information ratio α , defined by:

$$\alpha \equiv \frac{1}{N} \sum_{i=1}^N \alpha_i \equiv \frac{1}{N} \sum_{i=1}^N \frac{h}{h + s_i} = hV,$$

where α_i is analyst i 's individual common-to-total information ratio. When all available information is common, $\alpha = 1$. As h approaches zero—that is, as analysts share less and less common information— α approaches 0.

Another source of information asymmetry is differential uncertainty, which may exist because of differential quality of private information across analysts. Our measure of differential uncertainty, denoted by γ , measures relative differences across analysts' individual uncertainty. This differential uncertainty is defined by:

$$\gamma \equiv \frac{1}{N} \sum_{i=1}^N \gamma_i^2 \equiv \frac{1}{N} \sum_{i=1}^N \left(\frac{V_i - V}{V} \right)^2 = \frac{1}{V^2} \left[\frac{1}{N} \sum_{i=1}^N \left(\frac{1}{h + s_i} - \frac{1}{N} \sum_{i=1}^N \frac{1}{h + s_i} \right)^2 \right],$$

where γ_i is the relative deviation of analyst i 's individual uncertainty from the average. In other words, differential uncertainty γ is the average squared relative deviation of individual uncertainty from the average over N analysts.

The average covariance can now be written as:

$$\begin{aligned} C &= \frac{1}{N} \sum_{i=1}^N \left[\frac{1}{N-1} \sum_{j \neq i}^N \text{Cov}(y - \mu_i, y - \mu_j) \right] \\ &= \frac{1}{N} \sum_{i=1}^N \left[\frac{1}{N-1} \sum_{j \neq i}^N \text{Cov} \left(\frac{h(y - \bar{y}) - s_i \epsilon_i}{h + s_i}, \frac{h(y - \bar{y}) - s_j \epsilon_j}{h + s_j} \right) \right] \\ &= \frac{1}{N} \sum_{i=1}^N \left[\frac{1}{N-1} \sum_{j \neq i}^N \frac{h}{(h + s_i)(h + s_j)} \right] \\ &= \frac{h}{N(N-1)} \sum_{i=1}^N \left[\frac{1}{h + s_i} \sum_{j \neq i}^N \frac{1}{h + s_j} \right] \\ &= \frac{h}{N(N-1)} \left[\left(\sum_{i=1}^N \frac{1}{h + s_i} \right)^2 - \sum_{i=1}^N \frac{1}{(h + s_i)^2} \right] \\ &= \frac{-h}{N-1} \left[\frac{1}{N} \sum_{i=1}^N \left(\frac{1}{h + s_i} \right)^2 - \left(\frac{1}{N} \sum_{i=1}^N \frac{1}{h + s_i} \right)^2 - (N-1) \left(\frac{1}{N} \sum_{i=1}^N \frac{1}{h + s_i} \right)^2 \right] \\ &= \left(\frac{-1}{N-1} \right) \left(\frac{\alpha}{V} \right) [V^2 \gamma - (N-1)V^2] \\ &= V\alpha \left(1 - \frac{\gamma}{N-1} \right). \end{aligned}$$

Therefore:

$$\rho \equiv \frac{C}{V} = \alpha \left(1 - \frac{\gamma}{N-1} \right).$$

This relation shows that $\rho = \alpha$ if either $\gamma = 0$ or as N approaches infinity. When differential uncertainty exists (because of differential quality of private information across analysts) and N is finite, the average ratio of common information to total information (α) across analysts does not exactly translate into the ratio of common uncertainty to total uncertainty (ρ). Instead, consensus summarizes the effect of the two sources of information asymmetry on analysts' beliefs—namely, the relative presence of private information and differential uncertainty.

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Implicit Taxes in High Dividend Yield Stocks

Merle M. Erickson

Edward L. Maydew

University of Chicago

ABSTRACT: Implicit taxes reflect the extent (if any) to which tax-favored assets bear lower pretax returns than do tax-disfavored assets of similar risk. Prior research on implicit taxes has met with mixed results, particularly in equity securities, because of the difficulty in separating tax effects from effects caused by cross-sectional differences in risk. We avoid problems of risk by essentially comparing each security to itself before and after an unexpected change in the manner in which dividends are taxed to corporate investors. We find strong evidence of implicit taxes in preferred stocks. Extensive testing using the same event date indicates that no similar implicit tax effect exists in common stocks.

Key Words: *Dividends, Taxes, Implicit taxes.*

Data Availability: *Data are available from public sources.*

I. INTRODUCTION

Implicit taxes reflect the extent (if any) to which tax-favored assets bear lower pretax returns than do tax-disfavored assets of similar risk. Understanding the role that taxes play in determining equilibrium prices and pretax returns has been a central issue in accounting, finance and economics research for several decades. Unfortunately, both theoretical and empirical attempts at addressing this issue have produced mixed results.

Prior theoretical work (e.g., Dybvig and Ross 1986; Dammon and Green 1987; Scholes and Wolfson 1992) found that in markets with at least two assets taxed differently to at least two investors, the existence of a conventional no-arbitrage equilibrium depends critically on the existence of market imperfections and constraints (e.g., restrictions on short-selling). Given the large number of differentially taxed assets and investors that exist today, as well as the large number of market imperfections and tax code restrictions aimed at preventing tax arbitrage, the existence and magnitude of implicit taxes is largely an empirical question.

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Empirical research has found testing for implicit tax effects to be difficult. The fundamental problem is that cross-sectional studies that compare pretax returns on tax-favored and tax-disfavored securities find it difficult to separate tax effects from effects caused by cross-sectional differences in risk. Notable exceptions include Shackelford (1991), who examines implicit taxes in the market for ESOP loans; Guenther (1994), who documents implicit taxes in Treasury bills; Harris and Kemsley (1997), who investigate implicit taxes associated with the extent to which firms' equity is composed of retained earnings vs. paid-in capital; and Lang and Shackelford (1998), who investigate whether capital gains taxes are capitalized into the prices of common stocks.

In general, however, understanding whether taxes affect pretax returns has been contentious, particularly in equity securities. Risk is thought to play a major role in the expected pretax return of equity securities and without a complete understanding of how to precisely control for cross-sectional differences in such risk, testing for implicit taxes in equity securities has been difficult. In particular, researchers have tested extensively whether tax preferences associated with differences in the taxation of dividends and capital gains affect pretax returns. Despite decades of research (e.g., Black and Scholes 1974; Miller and Scholes 1982; Litzenberger and Ramaswamy 1979, 1982; Harris and Kemsley 1997; Fama and French 1998; Lang and Shackelford 1998), no consensus has been reached about whether or how taxes affect the pretax returns of stocks.

We avoid many of the problems that have plagued prior studies by examining stock price changes surrounding an unexpected proposal to change the way in which dividends are taxed to corporate investors. Specifically, the "dividends received deduction" gives corporate investors a special deduction typically equal to 70 percent of the dividend income they receive. In section II, we show that if this tax preference causes high dividend yield stocks to bear implicit taxes, the Treasury's proposal to cut the dividends received deduction to 50 percent could cause a decrease of up to 7.8 percent in the stock prices of dividend-paying equity securities.

Our study has at least three advantages over prior studies of implicit taxes in equity securities. First, our setting better enables us to distinguish between the effects of taxes and risk. Prior studies that examined stock returns over relatively long horizons were hampered by the inability to precisely capture the effects of cross-sectional risk differences among firms and intertemporal risk changes within firms.¹ By examining within-firm price changes to an exogenous event, we are less subject to confounding cross-sectional risk differences than prior studies. Second, the tax proposal we examine is targeted, affecting only a particular kind of asset (dividend-paying equity securities) held by a particular type of investor (corporations). This reduces the chances that the proposal will have widespread confounding effects on firms' underlying cash flows, unlike major tax acts (e.g., the Tax Reform Act of 1986). Third, the proposed tax change should affect some stocks more than others; specifically high dividend yield stocks should be affected more than low or no yield stocks. This allows us to use nondividend-paying stocks as a control group and to thereby rule out market-wide, or macroeconomic, effects.

Our results can be summarized as follows. We find that preferred stocks experienced a negative 1-percent abnormal return around the proposed reduction in the dividends received deduction. This suggests that preferred stocks bear implicit taxes as a result of the

¹ For example, risk differences would be problematic in our setting if we were to estimate implicit taxes by comparing the yields on preferred stock to the yields on corporate debt. We should also mention that Lang and Shackelford (1998) also use event study methodology (in their case to examine effects of capital gains taxes) and are therefore not subject to the problems that hindered prior studies.

tax-preference given to corporate investors. Further, the price decline in preferred stocks documented in this paper indicates that reducing the dividends received deduction would have adverse unintended consequences. Specifically, policy makers may be interested to know that decreasing the dividends received deduction will increase issuing firms' cost of capital.² Put another way, our evidence indicates that at least part of the increased tax burden is shifted from corporate investors to corporate issuers of preferred stock by increasing the pretax return required to successfully issue preferred stock.

The evidence indicates that high dividend yield common stocks did not experience a similar market reaction. We recognize that one must always be cautious about concluding that there was no market reaction to a particular event. In our setting, a lack of market reaction could indicate that the market thought it was unlikely that the Treasury proposal would become law, or that the market had already anticipated the proposal and adjusted prices at some earlier date. However, the fact that we do find a significant market reaction in the sample of preferred stocks indicates that the proposal did have surprise value and was taken seriously by the market. Further, our failure to find any market reaction within the set of high dividend yield common stocks could be attributed to the lack of sufficient power in our tests. However, we calculate the power of our tests and find that the tests are powerful enough to reasonably rule out all but extremely small implicit tax effects. Finally, it is possible that implicit tax effects occur, but only in subsamples of high yield common stocks and that our tests obscure this by commingling affected and nonaffected stocks. However, when we partition our sample based on dividend yield, we find no evidence that dividend yield is related to event-period abnormal returns. Based on the collective evidence, we conclude that high yield common stocks do not bear implicit taxes as a result of the dividends received deduction.

The finding that high dividend yield common stocks do not bear implicit taxes has important implications for prior research. A finding here that high dividend yield stocks did bear implicit taxes as a result of the dividends received deduction could have accounted for the inconclusive results in prior studies that looked for a relation between dividend yield and pretax returns (for a good summary of these studies, see Fama and French [1998]). These studies generally posit that *low* dividend yield stocks have smaller pretax returns because more of their expected return comes in the form of capital gains, which are generally more lightly taxed than dividends (at least to individual investors). If the dividends received deduction simultaneously pushes down the pretax returns of high yield stocks, then research examining the relation between dividend yield and pretax returns may be confounded by two opposing tax effects. Our evidence indicates, however, that such confounding effects are probably not a major problem.

Prior research has provided limited evidence supporting the existence of tax clienteles.³ Our tests of implicit taxes involve the joint hypotheses that corporate investors hold dividend-paying stocks and that these stocks bear implicit taxes due to the dividends received deduction. Evidence that equity prices declined in response to the Treasury's proposed cut in the dividends received deduction is consistent with the conclusion that

² The primary motivation for the proposed cut in the dividends received deduction was revenue generation, and Treasury personnel estimated that a cut in the dividends received deduction would increase revenues from corporate investors by about \$2.9 billion (Godfrey 1995). While reducing the dividends received deduction may increase tax revenues, our results indicate that corporate issuers will bear a substantial portion of the tax increase in the form of lost benefits from the implicit taxes previously borne by the corporate purchasers of the impacted securities. In other words, issuers will have a higher cost of capital.

³ An exception is Dhaliwal et al. (1998) who examine changes in ownership of common stocks in response to modifications in dividend policy.

corporations hold substantial amounts of preferred stock. In other words, our results support the notion that corporate investors form a tax clientele for preferred stock.

Finally, our results also bear upon the growing literature examining why firms issue preferred stock (e.g., Collins and Shackelford 1992; Kimmel and Warfield 1995; Callahan et al. 1998; Engel et al. 1998; Frischmann and Warfield 1998). Researchers have tried to understand why firms issue preferred stock, because it is tax disadvantaged at the issuer level relative to debt. Specifically, dividend payments on preferred stock are not tax-deductible to the issuer, while interest payments on debt are tax-deductible. However, to the extent that preferred stock bears implicit taxes as a result of the dividends received deduction, this reduces the pretax cost of capital to issuers of preferred stock. The lower pretax cost of capital (i.e., implicit tax effect) mitigates, to some extent, the disadvantage of not being able to deduct payments on preferred stock dividends and increases the attractiveness of preferred stock relative to debt. While there are undoubtedly many non-tax factors involved in the decision to issue preferred stock, our results suggest that preferred stockholders bear implicit taxes, partially accounting for its use as a source of capital (i.e., issuers are the beneficiaries of the tax favored treatment).

The remainder of the paper is organized as follows. Section II develops our hypotheses. Section III outlines our sample selection procedures and event study methodologies. Section IV presents the results and section V concludes the paper.

II. HYPOTHESES DEVELOPMENT

Implicit Taxes and Tax Arbitrage

Before discussing the effect of the dividends received deduction on pretax equity returns, we introduce some background on implicit taxes. We will show that in even a simplified setting with as little as two differently taxed assets and two differently taxed investors, it is difficult to determine what effect, if any, taxes will have on pretax returns. Suppose there are two types of investors: individuals and tax-exempt investors (e.g., pension funds) and two types of assets: taxable bonds and tax-free municipal bonds. For individuals to be indifferent between the corporate and municipal bonds the following must hold:

$$R_c(1 - \tau_p) = R_m \quad (1)$$

where R_c is the pretax return on the corporate bond, R_m is the pretax (and after tax) return on the municipal bond and τ_p is the marginal explicit tax rate faced by the individual investors. However, the following condition must hold for the tax-exempt investors to be indifferent between the two assets:

$$R_c = R_m \quad (2)$$

Both equations (1) and (2) cannot hold at the same time, except in the special case of $\tau_p = 0$. Extending the number of differently taxed assets and taxpayers increases the number of conditions that must hold for equilibrium to occur (Dammon and Green 1987), and Scholes and Wolfson (1992) show that tax arbitrage will eliminate all taxes in the absence of frictions (i.e., transactions costs) and tax-code restrictions.⁴

⁴ One example of an anti-arbitrage tax restriction is I.R.C. § 265, which disallows interest deductions on debt used to finance investments that generate tax-exempt income. Such restrictions are difficult to design and even more difficult to enforce, because they rely on being able to trace borrowings to particular assets. For example, high income individuals who own municipal bonds yet deduct mortgage interest on their personal residences are often engaging in tax arbitrage, but are rarely affected by the restrictions of I.R.C. § 265.

In settings with frictions, tax code restrictions and multiple classes of assets and investors, the extent to which taxes affect pretax rates of return becomes an empirical question. We can use theory, however, to place bounds on the implicit taxes that can arise. The lower bound of the implicit taxes on municipal bonds is zero and occurs if tax-exempt investors are the marginal investors (i.e., equation (2) holds). The upper bound implicit tax rate is τ_p and occurs if high-income individuals are the marginal holders (i.e., equation (1) holds).

The concept of implicit taxes is closely related to the concept of "tax clienteles." Clientele effects arise to the extent that investors with different marginal tax rates prefer to hold different portfolios, holding constant nontax considerations, such as risk preferences. Knowing the size of the implicit tax tells one the cut-off points for the tax clienteles (e.g., if the implicit tax rate in municipal bonds was 30 percent, then investors with marginal tax rates greater than 30 percent should invest in municipal bonds). Similarly, one could make inferences about the size of the implicit tax from data on clienteles (e.g., cross-sectional data on investment patterns of investors with different marginal tax rates but similar nontax characteristics). Most researchers opt to estimate implicit taxes because data on yields is easier to obtain than data on ownership. But implicit taxes and tax clienteles remain linked at the conceptual level.

Implicit taxes are also related to the concept of "tax capitalization" (see Zodrow 1991; Lang and Shackelford 1998). In tax capitalization, market prices of securities reflect future taxes that must be paid by investors on returns. Thus, securities whose future returns are likely to come in a tax-disadvantaged form sell at a discount (and will have higher pretax returns) relative to securities with tax-favored future returns. So while conceptually related, the term "implicit taxes" evokes studies of the effects of tax *preferences* on equilibrium pretax *returns*, while "tax capitalization" evokes studies of the effects of tax *burdens* on equilibrium *prices*.

Dividends Received Deduction, Implicit Taxes and Security Prices

In this section we (1) derive upper and lower bounds of the implicit taxes that could be induced by the dividends received deduction and (2) derive the predicted abnormal return from a change in the dividends received deduction assuming that the price of the tax-favored asset reflects the maximum implicit tax.

The implicit tax rate, τ_i , is defined as:

$$\tau_i = \frac{R_{df} - R_{tf}}{R_{df}} = 1 - \frac{R_{tf}}{R_{df}} \quad (3)$$

where R_{tf} is the pretax return on the tax-favored asset and R_{df} is the pretax return on a fully taxed (disfavored) asset with the same risk as the tax-favored asset (Scholes and Wolfson 1992, 88).

The maximum implicit tax caused by the dividends received deduction will occur when corporations are the marginal holders of stocks from which the entire expected return comes in the form of dividends (R_{df}). In equilibrium, the after-tax return on the tax-favored asset must be equal to that of the fully taxed asset (R_{df}). Thus:

$$R_{df}(1 - \tau) = R_{tf}[1 - \tau(1 - DRD)] \quad (4)$$

where τ is the statutory corporate tax rate and DRD is the dividends received deduction. By substituting equation (4) into equation (3), we find:

$$\tau_{L,max} = \frac{\tau(DRD)}{1 - \tau(1 - DRD)} \quad (5)$$

With $\tau = 35$ percent and $DRD = 70$ percent, this gives a maximum implicit tax rate caused by the dividends received deduction of 27.4 percent. The minimum implicit tax rate is zero and will occur if the marginal investors are individuals or tax-exempt institutions, or if none of the expected return from the stock comes in the form of dividends.

We next derive the predicted abnormal return from a change in the dividends received deduction when corporations are the marginal holders of stock. The price of a stock whose entire return comes from a known dividend paid in perpetuity can be expressed as:

$$P = \frac{d}{r} \quad (6)$$

where P is the price of the stock, d is the after-tax dividend and r is the after-tax discount rate. For a stock in which corporations are the marginal investors, equation (6) can be expressed as:

$$P_t = \frac{D\{1 - \tau[1 - E_t(DRD)]\}}{r} \quad (7)$$

where P_t is the price of the stock at time t , D is the pretax dividend and $E_t(DRD)$ is the time t expectation of the dividends received deduction. Define the return on the stock between periods t and $t - 1$ as:

$$\text{Return}_{t-1,t} = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (8)$$

Now consider the effect of a change in the expected dividends received deduction between periods t and $t - 1$ on the price of the stock. Substituting equation (7) into equation (8) we obtain:

$$\frac{P_t - P_{t-1}}{P_{t-1}} = \frac{\tau[E_t(DRD) - E_{t-1}(DRD)]}{1 - \tau[1 - E_{t-1}(DRD)]} \quad (9)$$

With the current corporate tax rate of 35 percent and dividends received deduction of 70 percent, a certain change to a 50 percent dividends received deduction would imply a price decrease of 7.82 percent.⁵ This represents the maximum theoretical price change that could occur as a result of the proposal. The minimum theoretical price change is zero if stocks do not bear implicit taxes as a result of the tax preference given to corporate investors.

Next, we show that the return caused by the change in the dividends received deduction can be used to estimate the implicit taxes born by stocks as a result of the dividends received deduction. As we stated in equation (3), the implicit tax rate is defined as $1 - R_{tr}/R_{dr}$.

⁵ The change in the stock price caused by a change in the dividend received deduction can be derived in a number of different ways, including taking the partial of price with respect to the dividends received deduction and then dividing by price.

where R_{tf} is the pretax return on the tax-favored asset and R_{df} is the pretax return on the tax-disfavored asset. In this setting, R_{tf} represents the pretax return with a dividends received deduction of 70 percent and R_{df} represents the pretax return with a dividends received deduction of 50 percent. By definition $R_{tf} = D/P_{tf}$ and $R_{df} = D/P_{df}$, where P_{tf} is the price of the stock with the 70 percent dividends received deduction and P_{df} is the price of the stock with the 50 percent dividends received deduction. Substituting these return equivalents into equation (3) we obtain:

$$\tau_i = 1 - \frac{R_{tf}}{R_{df}} = 1 - \frac{D/P_{tf}}{D/P_{df}} = - \left[\frac{P_{df} - P_{tf}}{P_{tf}} \right] \quad (10)$$

In our setting, the proposed change is a reduction in the dividends received deduction from 70 percent to 50 percent, so P_{tf} is the price at time $t - 1$ and P_{df} is the price at time t . Thus, equation (10) is equal to the negative of the return associated with the proposed cut in the dividends received deduction given in equation (8).⁶ This is an estimate of the implicit tax arising from the 20 percent increment (70 percent to 50 percent) in the dividends received deduction. An estimate of the implicit tax associated with the entire 70 percent dividends received deduction can be obtained by grossing up the return obtained in equation (8) by 70 percent/20 percent. If we find the maximum 7.82 percent change in price, this would imply an implicit tax rate of 27.4 percent (7.82 percent $\times$ 70 percent/20 percent) from the 70 percent dividends received deduction.

The Hypotheses

Preferred stocks are most likely to bear implicit taxes as a result of the dividends received deduction because their return comes almost entirely in the form of dividends and anecdotal evidence suggests that they are widely held by corporate investors. Therefore, our first hypothesis (stated in alternative form) relates to price changes of preferred stocks:

H1: Preferred stocks will experience negative abnormal returns around the announcement of the proposed cut in the dividends received deduction.

Common stocks that pay small or no dividends are less likely to be held by other corporations because much of their expected return comes in the form of capital gains. If the dividends received deduction causes implicit taxes in common stocks, it is most likely to be in high dividend yield common stocks. Our second hypothesis (stated in the alternative) relates to price changes of high dividend yield common stocks:

H2: High dividend yield common stocks will experience negative abnormal returns around the announcement of the proposed cut in the dividends received deduction.

III. SAMPLE SELECTION AND METHODOLOGY

Sample of Preferred Stocks

As a general rule, preferred stocks are among the highest dividend yield stocks available and are commonly believed to have heavy corporate ownership. Based on their high dividend yield and the fact that they are frequently marketed to corporate investors, we first

⁶ The equivalence of equations (8) and (10) does not depend on the entire return coming in the form of dividends. To see this, simply define $R = (D + C)/P$, where C accounts for any cash flows received by the shareholder not taxed as dividends.

analyze the impact of the proposed cut in the dividends received deduction on a sample of preferred stocks.

Table 1 details the sample selection procedure and breakdown. We first obtain a set of firms on the 1994 Compustat PST tapes with preferred stock issued and outstanding with a carrying value in excess of \$100 million. This *ad hoc* cutoff point is used to isolate a sample of preferred stock issues that are widely traded. An initial sample of 202 firms meet this criterion. We exclude those 96 preferred stocks for which price data are unavailable in the *S&P Daily Stock Price Record* (1995). We obtain daily closing price data for this set of preferred stocks over the period April 1, 1995 to March 29, 1996 from Interactive Data Services (IDS).⁷

Next we exclude convertible preferred stock issues (27 firms) because the price of convertible preferred could be affected by the value of the issuers' common stock, which could confound our analysis. Of the remaining securities, eight went ex-dividend during the week of December 7, 1995, two were hybrid securities and nine were thinly traded. All three groups of firms are excluded from the final sample, leaving us with 60 preferred stock issues.⁸ IDS has complete data for 51 of the 60 securities, which comprise our final sample of preferred stocks.

Table 1 also presents a breakdown of the final sample by two-digit SIC codes. It is readily apparent that over half of the sample of preferred stocks is concentrated in two industries: electric, gas and sanitary services (SIC 49, $n = 16$) and depository institutions (SIC 60, $n = 14$). This industry concentration is consistent with evidence in Callahan et al. (1998) that these industries are heavy users of preferred stock.

Sample of High Yield Common Stocks

We select a sample of high yield common stocks that potentially bear implicit taxes as a result of the dividends received deduction. Table 2, panel A presents the sample selection criteria. We identified all U.S. firms on the 1995 CRSP NYSE/AMEX tape that were paying quarterly cash dividends as of December 1, 1995. From this sample of 1,385 firms, we eliminated those firms that were in the two-digit SIC code 67, which includes real estate investment trusts (REITs) and closed-end mutual funds. We also eliminated limited partnerships and other REITs not included in the two-digit SIC 67. Dividends paid on these types of securities do not qualify for the dividends received deduction and therefore the proposed tax change does not affect the after tax return on these securities. This restriction reduces the sample by 328 firms.

We next exclude all firms that have outstanding preferred stock. The reason for this restriction is that a decline in the price of preferred stock could cause a decline in the price of common stock even if common stock did not bear implicit taxes. If preferred stock prices fall, their return goes up. This means that firms that rely on preferred stock as a source of capital will find that future preferred issues would require higher yields, which effectively increases these firms' cost of capital. This restriction eliminates 427 observations. After this screening process, 630 dividend-paying firms remain. The tax benefit to corporate investors of dividend-paying stocks is increasing in dividend yield. This fact makes it unlikely that a tax change affecting only corporate investors would affect relatively low dividend yield stocks. We therefore require the common stocks to have a dividend yield over 4 percent.

⁷ IDS supplies data to the *S&P Stock Record*, and hence preferred stocks not in the stock record are not tracked by IDS.

⁸ In 18 cases, the firm had more than one class of non-convertible preferred stock. For these firms we select the class of stock with the largest market capitalization.

TABLE 1
Preferred Stock Sample Selection and Composition

Panel A: Preferred Stock Sample Selection Procedure

Sample of U.S. Compustat PST firms with preferred stock carrying values over \$100 million	202
Data unavailable in the <i>S&P Stock Price Guide</i>	<u>96</u>
Remaining sample	106
Securities excluded:	
Convertible preferred	27
Ex-dividend day during the event week	8
Security is thinly traded	9
Hybrid securities	<u>2</u>
Preliminary sample	60
Firms for which IDS does not have complete data	<u>9</u>
Final sample	<u><u>51</u></u>

Panel B: Sample Composition by Two-Digit SIC

<i>Industry (Two-Digit SIC)</i>	<i>Number of Firms</i>	<i>% of Total</i>
Agricultural production (01)	1	2.0
Tobacco products (21)	1	2.0
Paper and allied products (26)	1	2.0
Petroleum refining (29)	1	2.0
Industrial machinery (35)	1	2.0
Transportation equipment (37)	2	3.9
Water transportation (44)	1	2.0
Transportation by air (45)	1	2.0
Electric gas and sanitary services (49)	16	31.4
Wholesale trade—nondurable (51)	1	2.0
General merchandise stores (53)	1	2.0
Eating and drinking places (58)	1	2.0
Depository institutions (60)	14	27.5
Nondepository credit institutions (61)	2	3.9
Security and commodity brokers (62)	4	7.8
Insurance carriers (63)	2	3.9
Business services (73)	<u>1</u>	<u>2.0</u>
Total	<u><u>51</u></u>	<u><u>100.0</u></u>

TABLE 2
Sample Selection and Composition: Dividend-Paying Common Stocks

Panel A: Sample Selection Procedure

Total number of U.S. NYSE/ASE firms paying quarterly dividends	1,385
Less: Firms in SIC Code 67, REITs and L.P.s	(328)
Less: Firms with preferred stock	(427)
Subtotal	<u>630</u>
Less: Securities with a dividend yield <4%	(545)
Less: Firms with ROE <5%	(12)
Less: Firms with less than \$100 million MVE	(12)
Dividend-paying sample firms	<u><u>61</u></u>

Panel B: Sample Composition by Two-Digit SIC

<u>Industry (Two-Digit SIC)</u>	<u>Number of Firms</u>	<u>% of Total</u>
Food and kindred products (20)	2	3.3
Tobacco products (21)	1	1.6
Apparel and fabrics (23)	1	1.6
Lumber and wood products (24)	1	1.6
Paper and allied products (26)	2	3.3
Printing and publishing (27)	3	4.9
Chemical products (28)	3	4.9
Petroleum refining (29)	2	3.3
Leather products (31)	1	1.6
Fabricated metals (34)	2	3.3
Industrial machinery (35)	1	1.6
Electronic equipment (36)	2	3.3
Transportation equipment (37)	1	1.6
Miscellaneous manufacturing (39)	1	1.6
Communications (48)	6	9.8
Electric gas and sanitary services (49)	20	32.8
Wholesale trade—nondurable (51)	2	3.3
General merchandise stores (53)	1	1.6
Eating and drinking places (58)	1	1.6
Depository institutions (60)	3	4.9
Insurance carriers (63)	3	4.9
Insurance agents (64)	1	1.6
Professional services (87)	<u>1</u>	<u>1.6</u>
Total	<u><u>61</u></u>	<u><u>100.0</u></u>

Dividend yield is dividends per share for fiscal 1994 divided by the fiscal year-end 1994 stock price. This eliminates 545 observations.⁹

We require firms to have a return on equity in excess of 5 percent. The reason for this requirement is that current dividend yield can be high in distressed firms with depressed stock prices. While the current dividend yield may be high, the future dividend is much less certain and corporate investors should be less likely to invest in these firms. Equity return is net income for fiscal 1994 divided by the book value of equity at fiscal year-end 1994. This restriction eliminates 12 firms. Finally, we require sample firms to have a minimum market value of common equity of \$100 million since corporate investors may be unlikely to hold securities in small, thinly traded firms. This reduces the sample by 12 observations, which results in a final sample of 61 common stocks.

Panel B of table 2 presents the breakdown of the sample by two-digit SIC. Firms in the electric, gas and sanitary industries (SIC = 49) comprise over 30 percent of the sample, but with the exception of that concentration, sample firms are spread fairly evenly across 23 two-digit SICs.

Event Dates

On December 7, 1995, in a surprise announcement, the Treasury department proposed to cut the dividends received deduction from 70 percent to 50 percent. The motivation for this proposal was to "eliminate corporate welfare" and raise tax revenues. The proposed change in the dividend received deduction was a surprise to the market and several expert commentators suggested that, if enacted, this tax law change could have a substantial impact on the price of dividend-paying equity securities and the capital structure choices of issuers.¹⁰ The *Wall Street Journal* (Duff 1995), for example, reported that "analysts fear it could hurt the broader stock market because it would make stocks, particularly preferred stocks, less attractive to corporate investors."

Discussion of the provision was protracted. Republican leaders countered by opposing the provision as part of the normal give-and-take of budget negotiations. The *Chicago Sun-Times* reported (Martin and Kleinbard 1995) that "Rep. Bill Archer (R-Texas), the chairman of the tax-writing House Ways and Means Committee, has sent a letter to Clinton opposing the proposed reduction of the dividends received deduction....Still, there are no guarantees Congress won't pass some reduction in the DRD." The *BNA Daily Tax Report* (1996) reported that both sides had reached agreement on specific revenue provisions "but the matter of trimming back the dividends-received deduction to 50 percent remains unresolved." While the proposal to cut the dividends received deduction was not included in the final tax changes, it is still discussed as a possible revenue-raising provision.

Although there have been other reductions or proposed reductions in the dividends received deduction, the December 1995 proposal stands out as an ideal event date for three reasons. First, the proposed change was substantial. As we have shown, a reduction in the dividends received deduction from 70 percent to 50 percent implies a negative abnormal return of up to 7.8 percent in high yield stocks—an impact large enough to be detectable

⁹ Our main tests focus on high yield common stocks because this is the group that is likely to be impacted by changes in the DRD. However, later in the paper we conduct tests with the 630 dividend-paying firms as a check on the robustness of our main results.

¹⁰ Specifically, commentators suggested that this change would reduce the value of outstanding preferred stock in response to investors' demands for a higher pretax return. This line of reasoning suggests that a cut in the dividends received deduction increases the cost of equity capital leading some issuing firms to substitute debt for preferred stock. See, *BNA Daily Tax Report* (1995) "Clinton's Proposal Will Depress Markets, Kill New Financial Products, Experts Say"; Martin and Kleinbard (1995); Flaherty (1996).

in an event study. The dividends received deduction has been reduced in the past (i.e., from 85 percent to 80 percent by the Tax Reform Act of 1986 and from 80 percent to 70 percent by the Revenue Reconciliation Act of 1987), but these reductions were much smaller.

Second, this announcement was a surprise. In contrast, the 1987 decrease from 80 percent to 70 percent was initially passed by the House as only a decrease to 75 percent. The Senate opposed any cut, but the Joint Committee finally agreed upon a cut to 70 percent. Therefore, news of the decrease was protracted and gradual. Finally, the proposed cut we examine was relatively isolated from other tax law changes. The Tax Reform Act of 1986, for example, changed the relative tax rates on dividends and capital gains for individual investors—changes that could obscure any effect of the reduction in the dividends received deduction.

IV. RESULTS

Main Tests for Implicit Taxes in Preferred Stocks

We compute the raw return on each preferred stock as the difference in the closing price of the security on December 8, 1995 and the closing price on December 6, 1995 divided by the closing price on December 6, 1995.¹¹ Knowledge about preferred stock returns is considerably less advanced than knowledge about common stock returns. Consequently, we determine the unusualness of event-period preferred stock returns in several different ways. As indicated in panel A of table 3, for the 51 firms in our sample, the average two-day raw return is -1.43 percent ($p < .001$). Similarly, the median raw return for this two-day event period is -1.04 percent ($p < .001$). Eighty-six percent of the preferred stocks realized negative returns over this two-day event window.

We also computed the market-adjusted return for our portfolio of preferred stocks during the event period. We used two market benchmarks: the CRSP value weighted index and the CRSP equally weighted index. We computed the market-adjusted return for the portfolio of preferred stocks as the raw return less the market return for the event period. As panel A of table 3 indicates, the average market adjusted return is -0.86 percent (-1.25 percent) when using the CRSP value weighted index (equally weighted index) as the market proxy. Both are significantly negative at less than the 0.001 level. When using the value weighted index (equally weighted index) as a proxy for the market, 72.5 percent (84.3 percent) of the preferred stocks realized negative market-adjusted returns.

The far right column of panel A controls for the possibility that changes in interest rate expectations could be affecting the preferred stock returns, but not be fully captured in the market returns of common stocks. To control for this possibility, we compare the returns to our sample of preferred stocks with the return to the Lehman Brothers Treasury Bond index over the same two-day event window. The abnormal returns to preferred stocks remain significantly ($p < .001$) negative relative to this benchmark, suggesting that unanticipated interest rate changes do not explain the preferred stock returns during the event period.

In another test, we compute market model abnormal returns by estimating the following regression for each of the 51 preferred stocks:

$$R_{it} = \alpha_i + \beta_1 R_{mt} + \gamma_1 \text{RULING}_t + \varepsilon_{it} \quad (11)$$

¹¹ Hand et al. (1992) use a similar approach when analyzing the impact of bond rating changes on the prices of preferred stocks.

TABLE 3
Preferred Stock Abnormal Returns Around the Proposed Cut
in the Dividends Received Deduction on December 7, 1995

Panel A: Two-Day Raw Returns

	<u>Raw Return^a</u>	<u>Market-Adjusted Raw Return^b</u>	<u>Market-Adjusted Raw Return^c</u>	<u>Market-Adjusted Raw Return^d</u>
Mean	-1.43%*	-0.86%*	-1.25%*	-1.30%*
t-statistic ^e	-6.64	-4.00	-5.79	-6.04
Median	-1.04%*	-0.48%*	-0.86%*	-0.91%*
z-statistic ^f	-5.57	-4.04	-5.52	-5.52
n	51	51	51	51
Number < 0	44	37	43	44
Percentage < 0	86.3%*	72.5%*	84.3%*	86.3%*
z-statistic ^g	-5.18	-3.22	4.90	-5.18

Panel B: Market Model Abnormal Returns: $R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i RULING_{it} + \varepsilon_{it}$

	<u>When the Market is Proxied by the Value Weighted Index</u>	<u>When the Market is Proxied by the Equally Weighted Index</u>
Mean γ	-1.08%*	-1.13%*
t-statistic ^e	-5.91	-6.05
Median γ	-0.93%*	-0.96%*
z-statistic ^f	-4.71	-4.64
n	51	51
Number of γ s < 0	44	44
Percentage of γ s < 0	86.3%*	86.3%*
z-statistic ^g	-5.18	-5.18
Mean R ²	0.0326	0.0329

Panel C: Time-Series Portfolio Raw Return Analysis

	<u>Single-Day Return 12/7/1995</u>	<u>Two-Day Return 12/8/95 and 12/8/95</u>
Portfolio return for event period	-1.14%	-1.43%
Average daily (two-day) portfolio return over 250 days surrounding event	0.06%	0.11%
Median daily (two-day) portfolio return over 250 days surrounding event	0.02%	0.04%
Standard deviation of daily (two-day) portfolio return	0.18%	0.27%

(Continued on next page)

TABLE 3 (Continued)

-
- * Significant at less than the .01 level (two-tail test)
 - ^a Raw return computed as the change in closing price from December 6, 1995 to December 8, 1995, divided by the December 6, 1995 closing price.
 - ^b Raw return adjusted for the market return, which is defined as the CRSP Value Weighted Index.
 - ^c Raw return adjusted for the market return, which is defined as the CRSP Equally Weighted Index.
 - ^d Raw return adjusted for the market return, which is defined as the Lehman Brothers Treasury Bond Index.
 - ^e Cross-sectional t-statistic computed as the mean return metric divided by the standard error of the return metric for all firms.
 - ^f Sign rank z-statistic testing the hypothesis that the median return metric is significantly less than zero.
 - ^g Binomial z-statistic testing the hypothesis that the proportion of return metrics that are less than zero is significantly different than 50 percent.
-

where:

- R_{it} = return to preferred stock i on day t ;
- R_{mt} = market return on day t ;
- $RULING_t$ = an event-period indicator variable taking the value one on the 7th and 8th of December 1995, zero otherwise;
- t = day -150 to $+23$ where day 0 is December 7, 1995, the date that the Treasury proposed to cut the dividends received deduction from 70 percent to 50 percent.

We test the prediction that the proposed cut in the dividends received deduction had a negative impact on the price of preferred stocks based on the 51 γ coefficients produced in the estimation of equation (11).¹²

Panel B of table 3 reports the results of the market model regression. When using the value-weighted index to proxy for market returns, the average abnormal return estimate for the two days around the proposed cut in the dividends received deduction is -1.38 percent ($p < 0.001$). The median abnormal return is -0.93 percent ($p < 0.001$) and 44 of the 51 firm-specific event-period abnormal returns (γ coefficients) are negative. Qualitatively similar results and inferences result when the equally weighted index is used to proxy for the market.¹³ Overall, these results indicate that preferred stocks bear implicit taxes as a result of the dividends received deduction.

The reported significance levels in panels A and B may be inflated by cross-sectional correlation caused by event date clustering. Accordingly, we aggregate all 51 preferred stocks into one equally weighted portfolio and test the significance of the event-period return of this portfolio. This approach has been suggested by Bernard (1987) and was used with preferred stocks by Linn and Pinegar (1988). The main disadvantage is that aggregation can result in a loss of power by not exploiting all of the information in the data. As reported in panel C of table 3, the one-day event (December 7, 1995) return using this approach is -1.14 percent, which is over six standard deviations from the average nonevent-period return. The two-day event return is -1.43 percent, which is over five

¹² Marais et al. (1989) apply the market model to preferred stocks and also find that the explanatory power of the model is quite modest.

¹³ When the event period is defined as December 7, 1995, the average (median) abnormal return is -1.12 percent (-0.96 percent) which is significantly negative at the 0.001 (0.001) level.

standard deviations from the average nonevent two-day return. These conservative tests indicate that cross-sectional correlation does not appear to be driving the results.

Tests of the Robustness of Implicit Taxes in Preferred Stocks

Panels A, B and C of table 4 present tests on the robustness of our results across industry, dividend yield and firm size, respectively. Panel A indicates that the negative event-period returns are not driven by a single industry. Panel B shows that partitioning the data on dividend yield does not appear to affect the results. While this may appear surprising, there is little variation in the dividend yield of the preferred stocks in our sample and our analysis in section II showed that the market reaction should not depend on dividend yield for stocks whose entire expected return comes in the form of dividends. Panel C shows that the negative returns are not driven by firm size.

Implications for Implicit Taxes in Preferred Stock

In this section we use our estimated event-period returns to estimate the implicit taxes born by preferred stock as a result of the dividends received deduction as expressed in (10). Assuming that the market believed that it was certain that the dividends received deduction cut would become law, the largest magnitude market reaction from the earlier tests (-1.43 percent) suggests that if the entire 70 percent dividends received deduction had been removed, the market reaction would have been -5.01 percent (-1.43 percent $\times$ 70 percent / 20 percent). This is equivalent to estimating that preferred stocks were subject to a 5.01 percent implicit tax rate given that the dividends received deduction is 70 percent. Using the smallest magnitude market reaction (-0.86 percent) reduces the estimated implicit tax rate to 3.01 percent.

These estimated implicit taxes should be interpreted cautiously, as we have no way of knowing how likely the market thought it was that the proposal would pass. If, for example, the market thought the proposal had only a 50 percent (25 percent) chance of passing, then the true implicit tax would be twice our estimate and would be in the 6 percent to 10 percent (12 percent to 20 percent) range. A similar effect will happen to the extent that the market anticipated the proposal and prices adjusted outside of our event window. These estimates of implicit taxes are within the bounds predicted by theory; our earlier analysis revealed that the minimum implicit tax on preferred stock was zero and the maximum implicit tax was 27.4 percent. Studies examining implicit taxes in municipal bonds also find that implicit taxes tend to be far below the theoretical upper bound (Mankiw and Poterba 1996).

Tests for Implicit Taxes in High Yield Common Stocks

For our sample of high dividend yield common stocks, we compute market model abnormal returns for December 7 and December 8, 1995. As panel A of table 5 indicates, the mean and median abnormal common stock return for these firms are not statistically different from zero at conventional levels. Panel A uses equally weighted market returns; the same general result is found in panel B using value weighted market returns. Before concluding that high yield common stocks do not bear implicit taxes, however, we first perform a battery of additional tests and then calculate the power of our tests.

There are several possible reasons why we might find no implicit tax effect when in fact one existed. To begin with, the return to dividend-paying common stocks may have been significantly negative relative to nondividend-paying firms for the event period. Accordingly, we performed the same estimation procedure on the returns of a matched control

TABLE 4
Preferred Stock Abnormal Returns
Around the Proposed Cut in the Dividends Received Deduction on December 7, 1995
Categorized by Industry, Dividend Yield and Firm Size

Panel A: Two-Day Raw Returns By Industry^{a,b}

	<u>Utilities</u>	<u>Financial Institutions</u>	<u>All Others</u>
Mean	-1.54%*	-1.30%*	-1.56%*
t-statistic ^c	-4.86	-4.50	-2.75
Median	-1.42%*	-0.96%*	-1.47%*
z-statistic ^d	-3.27	-5.52	-5.52
n	17	21	13
Number < 0	14	18	12
Percentage < 0	82.4%*	85.7%*	92.3%*
z-statistic ^c	-2.67	-3.27	-3.05

Panel B: Two-Day Raw Returns by Dividend Yield^f

	<u>High Dividend Yield</u>	<u>Low Dividend Yield</u>
Mean	-1.35%*	-1.51%*
t-statistic ^c	-3.91	-6.05
Median	-0.97%*	-1.40%*
z-statistic ^d	-5.52	-5.52
n	26	25
Number < 0	21	23
Percentage < 0	80.8%*	92.0%*
z-statistic ^c	-3.14	-4.20

Panel C: Two-Day Raw Returns By Firm Size^g

	<u>Large Firms</u>	<u>Small Firms</u>
Mean	-1.45%*	-1.41%*
t-statistic ^c	-4.55	-4.85
Median	-0.99%*	-1.19%*
z-statistic ^d	-5.52	-5.52
n	25	26
Number < 0	20	24
Percentage < 0	80.0%*	92.3%*
z-statistic ^c	-3.00	-4.31

(Continued on next page)

TABLE 4 (Continued)

-
- * Significant at less than the .01 level (two-tail test).
 - ^a Raw return computed as the change in closing price from December 6, 1995 to December 8, 1995, dividend by the December 6, 1995 closing price.
 - ^b Firms in two-digit SIC 49 were classified as utilities and firms in two-digit SICs 60–62 and 67 were classified as financial institutions.
 - ^c Cross-sectional t-statistic computed as the mean return metric divided by the standard error of the return metric for all firms.
 - ^d Sign rank z-statistic testing the hypothesis that the median return metric is significantly less than zero.
 - ^e Binomial z-statistic testing the hypothesis that the proportion of return metrics that are less than zero is significantly different than 50 percent.
 - ^f Firms with a dividend yield greater (less) than the median dividend yield (7.97 percent) were classified as high (low) dividend yield.
 - ^g Large (small) firms are firms with a market value of common equity greater (less) than the median market value of equity (\$6.2 billion) of sample firms.
-

sample of nondividend-paying firms. Control firms were required to meet the following sample selection criteria: (1) not have paid a cash dividend in 1995, (2) not have preferred stock outstanding, (3) have a market value of common equity of at least \$100 million, (4) have a return on equity of at least 5 percent and, (5) be in one of the same two-digit SICs as the sample of dividend-paying common stocks. This selection procedure results in a control sample of 105 firms.

As panel A of table 5 indicates, the mean and median abnormal returns accruing to non-dividend paying firms are not significantly different from zero. Qualitatively similar results are found in panel B using value weighted market returns. We also computed the difference in abnormal returns accruing to the portfolio of dividend-paying firms relative to the portfolio of nondividend-paying firms. While the mean and median returns accruing to dividend-paying firms are less than the returns earned by zero dividend firms, the differences are not significant at the 5 percent level.

Another possible reason for the no-reaction results with the high yield common stocks is lack of power. Accordingly, we calculate the power of our tests with respect to various levels of "true" abnormal returns using a 5 percent one-sided alpha level and the standard error from panel A of table 5. For example, a negative 1-percent abnormal return (comparable to the abnormal return detected in the preferred stocks) has a 99.9 percent chance of being detected. Even an abnormal return one-half as large as the estimated preferred return, -0.5 percent, has an 81.8 percent chance of being detected and a return one-fifth as large, -0.2 percent, has a 26.7 percent chance of being detected. This indicates that if high yield common stocks did experience abnormal returns then those returns and the implicit tax effects that they imply must have been quite small.

Insignificant event-period abnormal returns for high dividend yield common stocks would be expected if corporations are not the marginal investor in these securities because the change in tax rate that is the focus of this study only applied to corporate investors. Some prior research has found evidence consistent with the conclusion that high yield common stocks are held by low tax-rate investors (e.g. Pettit 1977; Chaplinsky and Seyhun 1990).

Broadening the Sample of Common Stocks

We restricted our prior tests (table 5) to high dividend yield common stocks because such stocks would bear the most implicit tax and be the most impacted by the proposed

TABLE 5
Common Stock Abnormal Returns Around the Proposed Cut in the
Corporate Dividends Received Deduction on December 7, 1995
High Dividend Yield and Zero Dividend Stocks

Panel A: Two-Day Market Model Abnormal Returns: $R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$ ^a
Market is Proxied by the CRSP Equally Weighted Index

	<i>High Dividend Yield Stocks</i>	<i>Zero Dividend Stocks</i>	<i>Difference</i>
Mean	-0.21%	0.36%	-0.57%
t-statistic ^b	-1.07	1.48	-1.63
p-value (two-tailed)	(0.285)	(0.139)	(0.103)
Median	-0.08%	0.27%	-0.35%
z-statistic ^c	-1.05	1.60	-0.8
p-value (two-tailed)	(0.294)	(0.111)	(0.424)
% Negative	54.1%	41.0%	
z-statistic ^d	-0.64	0.74	
p-value (two-tailed)	(0.522)	(0.459)	
n	61	105	

Panel B: Two-Day Market Model Abnormal Returns: $R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$ ^a
Market is Proxied by the CRSP Value Weighted Index

Mean	-0.03%	0.60%*	-0.63%
t-statistic ^b	-0.18	2.41	-1.76
p-value (two-tailed)	(0.861)	(0.016)	(0.078)
Median	0.00%	0.49%*	-0.49%
z-statistic ^c	0.00	2.69	-1.45
p-value (two-tailed)	(1.000)	(0.007)	(0.147)
% Negative	49.2%	63.8%*	
z-statistic ^d	0.13	2.83	
p-value (two-tailed)	(0.897)	(0.005)	
n	61	105	

* Significant at less than the .01 level (two-tail test).

^a The market model is estimated over the period beginning 250 days prior to the proposed cut in the dividends received deduction and ending six days prior to the same date.

^b Cross-sectional t-statistic computed as the mean return metric divided by the standard error of the return metric for all firms.

^c Sign rank z-statistic testing the hypothesis that the median return metric is significantly less than zero.

^d Binomial z-statistic testing the hypothesis that the proportion of return metrics that are less than zero is significantly different than 50 percent.

change in the dividends received deduction. However, it is possible that our prior tests (table 5) failed to detect a price reaction in common stocks because the sample selection criteria were overly restrictive. Accordingly, we perform additional tests for market reactions using a broader sample of common stocks. We relax the sample selection criteria to include all common stocks that are: (1) listed on the New York or American Stock Exchange, (2) are not in SIC 67, are not limited partnerships or REITs and (3) do not have preferred stock outstanding. Using these criteria, we identified 630 dividend-paying stocks and 485 nondividend-paying stocks.

Table 6 reports the results of tests like those performed in table 5, but on this broader sample of stocks. Average abnormal return results continue to support the conclusion of no implicit taxes in common stocks. For example, panel A reveals that the mean two-day abnormal return in the dividend-paying stocks is 0.03 percent ($t = 0.33$). The difference in the mean returns of the dividend- and nondividend-paying stocks is -0.09 percent and is also not statistically significant ($t = -0.44$). Panel A's abnormal returns are based on value weighted market returns and similar results are found in panel B using equally weighted returns.

Examining median abnormal returns presents a murkier picture, however. The panel A median return of the dividend-paying stocks is insignificantly different from zero (0.04 percent, $z = 0.12$), but the median abnormal returns of the dividend and non-dividend paying stocks are significantly different ($z = -2.24$). The significant difference in medians is consistent with the conclusion that the proposed reduction in the dividends received deduction had a negative effect on the value of dividend-paying stocks.

In order to probe the robustness of the difference in medians, we perform some additional tests that control for the level of dividends paid.¹⁴ In table 7 we regress the two-day event-period abnormal returns on several dividend yield-based variables for the sample of 630 dividend-paying common stocks. If the significant results documented in table 6 are due to dividend-related effects, then the stock price reaction to the proposed reduction in the dividends received deduction should be a negative function of dividend yield. To test this proposition, we estimate the following regression.

$$AR_i = \alpha + \beta_1 * DIVYIELD_i + \epsilon_i \quad (12)$$

where:

AR_i = the two-day (December 7 and 8, 1995) market model abnormal return of stock i ;

$DIVYIELD_i$ = dividends per share for fiscal 1994 divided by the fiscal year end 1994 stock price.

We also replace the variable $DIVYIELD$ with dividend yield quartile indicator variables and with a dummy variable that takes the value one for stocks with dividend yields above the 90th percentile of all dividend-paying common stocks in our sample.

If dividend-paying common stocks bear implicit taxes due to the dividends received deduction we would expect to observe a negative coefficient on $DIVYIELD$ and the high yield quartile dummy variables. As column A of table 7 indicates, the coefficient on

¹⁴ A difference in medians with no difference in means may be due to positive outliers in the zero dividend sample. As a result, we removed all stocks with absolute event period abnormal returns greater than 10 percent. Results are qualitatively the same as reported in table 6. We also removed all stocks with absolute event period abnormal returns greater than 5 percent and again obtained results similar to those presented in table 6.

TABLE 6
Common Stock Abnormal Returns Around the Proposed Cut
in the Corporate Dividends Received Deduction on December 7, 1995
Large Sample of Dividend Paying Stocks and Zero Dividend Stocks

Panel A: Two-Day Market Model Abnormal Returns: $R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$ ^a
Market is Proxied by the CRSP Value Weighted Index

	<i>Dividend- Paying Firms</i>	<i>Zero Dividend Firms</i>	<i>Difference</i>
Mean	0.03%	0.12%	-0.09%
t-statistic ^b	0.33	0.78	-0.44
p-value (two-tailed)	(0.262)	(0.435)	(0.658)
Median	0.04%	0.36%	-0.32%
z-statistic ^c	0.12	0.84	-2.24
p-value (two-tailed)	(0.903)	(0.401)	(0.025)
% Negative	49.0%	44.9%	
z-statistic ^d	0.48	2.22	
p-value (two-tailed)	(0.631)	(0.026)	
n	630	485	

Panel B: Two-Day Market Model Abnormal Returns: $R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$ ^a
Market is Proxied by the CRSP Equally Weighted Index

Mean	-0.17%	0.01%	-0.18%
t-statistic ^b	-1.87	0.01	-0.97
p-value (two-tailed)	(0.062)	(0.996)	(0.332)
Median	-0.16%	0.19%	-0.35%*
z-statistic ^c	-2.61	0.02	-2.81
p-value (two-tailed)	(0.009)	(0.984)	(0.005)
% Negative	53.4%	45.2%	
z-statistic ^d	-1.71	2.13	
p-value (two-tailed)	(0.087)	(0.033)	
n	630	485	

* Significant at less than the .01 level (two-tail test).

^a The market model is estimated over the period beginning 250 days prior to the proposed cut in the dividends received deduction and ending six days prior to the same date.

^b Cross sectional t-statistic computed as the mean return metric divided by the standard error of the return metric for all firms.

^c Sign rank z-statistic testing the hypothesis that the median return metric is significantly less than zero.

^d Binomial z-statistic testing the hypothesis that the proportion of return metrics that are less than zero is significantly different than 50 percent.

TABLE 7
Regression of Common Stock Abnormal Returns on Dividend Yield

<i>Variable</i>	<i>(A)^d</i>	<i>(B)^d</i>	<i>(C)^d</i>
INTERCEPT	0.0012 (0.75)	0.0001 (0.07)	0.0003 (0.31)
DIVYIELD ^a	-0.0406 (-0.69)		
2ND QUARTILE ^b		0.0010 (0.37)	
3RD QUARTILE		0.0010 (0.37)	
4TH QUARTILE		-0.0012 (-0.48)	
HIGH DIVIDEND YIELD INDICATOR ^c			0.0000 (0.00)
n	630	630	630
R ²	0.001	0.002	0.000

^a DIVYIELD is dividend per share divided by price per share as of year end 1994.

^b Dividend yield indicator variables (e.g., 2ND QUARTILE) take the value one if the stock's dividend yield is in the nth quartile of dividend yield, and zero otherwise. The 2ND QUARTILE includes stocks with dividend yields between 1.1 percent and 2.1 percent. The 3RD QUARTILE includes stocks with dividend yields above 2.1 percent but below 3.1 percent, while stocks in the 4TH QUARTILE have dividend yields in excess of 3.1 percent.

^c HIGH DIVIDEND YIELD INDICATOR takes the value one if the stock's dividend yield is above the 90th percentile (4.5 percent dividend yield) of dividend-paying sample firms, and zero otherwise.

^d T-statistics are in parentheses below coefficient estimates.

DIVYIELD is negative as expected, but not significantly different from zero ($t = -0.69$). A regression that includes quartile indicator variables, as reported in column B, produces qualitatively similar results; common stocks with higher dividend yields did not experience larger negative abnormal returns in response to the proposed cut in the dividends received deduction. Column C of table 7 likewise provides no support for the conclusion that high dividend yield common stocks experienced significantly negative abnormal returns during the event period relative to lower yield stocks. We interpret the results in table 7 as providing strong evidence consistent with the conclusion that dividend-paying common stocks do not bear implicit taxes as a result of the dividends received deduction.

It is possible that firms change their dividend policies in response to modifications in the dividends received deduction. If the proposed tax change causes firms to change their dividend payouts, then our tests, which assume that future dividend streams are unaffected by the dividends received deduction, could be confounded. To test this possibility, we computed, for the past 25 years, the annual mean dividend yields for the portfolio of all dividend-paying stocks listed on CRSP. We regressed these annual dividend yields on the dividends received deduction and a time trend variable and found that neither variable was significant at explaining average dividend yields. We also found no effect using median

dividend yields and examining only high dividend yield common stocks (i.e., dividend yields greater than 4 percent). In sum, our tests do not appear to be confounded by changes in firms' dividend policies.

Based on the cumulative evidence, we conclude that common stocks do not bear implicit taxes as a result of the tax preference known as dividends received deduction. This indicates that prior studies that have failed to find a "dividend yield" effect in common stocks were not confounded by ignoring possible implicit taxes caused by the dividends received deduction.

V. SUMMARY AND CONCLUSIONS

We examined whether high dividend yield stocks bear implicit taxes due to the corporate dividends received deduction. Prior work has found that testing for implicit tax effects is extremely difficult, especially in equity securities. The fundamental empirical problem is that cross-sectional studies comparing pretax returns on tax-favored and tax-disfavored securities find it difficult to separate tax effects from cross-sectional differences in risk. We avoided this problem by examining price changes around an unexpected proposed change in the degree to which a particular security receives favorable tax treatment. Since we essentially compared each security to itself (before and after the tax proposal) we did not have to worry about cross-sectional differences in risk confounding our implicit tax estimates.

The event we examined was a 1995 Treasury Department proposal to reduce the dividends received deduction from 70 percent to 50 percent. This unexpected proposal would have increased the taxation of dividends received by corporate investors. For a sample of preferred stocks, we document significant negative abnormal returns in response to the proposed cut in the dividends received deduction. The significant decline in the price of preferred stocks indicates that these stocks bear implicit taxes as a result of the dividends received deduction.

We found that high dividend yield common stocks do not bear implicit taxes as a result of the dividends received deduction. Power calculations indicated that if high dividend yield common stocks do bear implicit taxes as a result of this tax preference, the implicit taxes would have to be quite small to be missed by our tests. We also investigated a broader sample of dividend-paying common stocks. We were unable to find conclusive evidence of implicit taxes within this broader sample. This finding has important implications for prior and current research investigating the relation between dividend yields and pretax returns. Those studies generally posit that low dividend yield stocks must have lower risk-adjusted pretax rates of return because a greater proportion of their return comes in the form of capital gains than in dividends, and capital gains are generally tax-favored to individual investors. If the dividends received deduction caused high yield stocks to have low pretax returns, then the failure of prior researchers to find the posited positive relation between dividend yields and pretax returns could have been explained by the existence of this unconsidered opposing influence. Our evidence indicates, however, that such a confounding effect is not a major problem.

Finally, our results also provide evidence useful to researchers who attempt to explain why firms issue preferred stock. Because preferred dividends are not tax deductible, while interest on debt is, preferred stock is seemingly disadvantaged at the issuer level. However, to the extent that preferred stock bears implicit taxes as a result of investor-level tax preferences, this lowers the cost of capital to preferred issuers. While there are undoubtedly many nontax factors involved in the decision to issue preferred stock, the implicit tax effects

we document provide at least a partial explanation for the attractiveness of preferred stock as a source of capital relative to debt.

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Corporate Disclosure Quality and the Cost of Debt

Partha Sengupta
University of Hawaii at Manoa

ABSTRACT: This paper provides evidence that firms with high disclosure quality ratings from financial analysts enjoy a lower effective interest cost of issuing debt. This finding is consistent with the argument that a policy of timely and detailed disclosures reduces lenders' and underwriters' perception of default risk for the disclosing firm, reducing its cost of debt. The results also indicate that the relative importance of disclosures is greater in situations where there is greater market uncertainty about the firm as reflected by the variance of stock returns. Since debt financing is an important source of external financing for publicly traded firms, the results have important implications on our understanding of the motives and consequences of corporate disclosures.

Key Words: *Disclosure quality, Cost of debt, Bond yield, Interest cost.*

Data Availability: *Data are publicly available from sources identified in the paper.*

I. INTRODUCTION

This paper investigates the link between a firm's overall disclosure quality and its cost of debt financing. The literature on the determinants of cost of debt generally documents a negative association between measures of the default risk of the firm and the cost of debt.¹ This study is based on the idea that lenders and underwriters consider a firm's disclosure policy in their estimate of default risk. Some support for this idea is found in Standard & Poor's (1982, 25) which states that S&P considers accounting quality as a factor in establishing the rating of an industrial bond issue. This practice suggests that firms that consistently make timely and informative disclosures are perceived to have a lower

¹ See for example, Fisher (1959), Jaffee (1975), Kidwell et al. (1984) and Fung and Rudd (1986).

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likelihood of withholding value-relevant unfavorable information. As a result these firms are charged a lower risk premium.

The results of the paper are consistent with the above argument. A firm's disclosure policy is measured by financial analysts' evaluations of corporate disclosure practices, available from the annual volumes of the *Report of the Financial Analysts Federation Corporate Information Committee*.² Each volume provides evaluations of a sample of 400–500 firms based on their disclosures through annual and quarterly reports, 10k, press releases and other public announcements and discussion with financial analysts. Two alternative measures of the cost of debt of the firm are considered here: (1) the yield to maturity on new debt issues and (2) the total interest cost of new debt issues, which is based on the amount received by the issuer, net of underwriter discount. Results show that both measures of cost of debt are negatively associated with the disclosure measure, after controlling for other potential determinants of a firm's cost of debt. The results also indicate that disclosures are more important for firms that face large uncertainty as measured by the standard deviation of daily stock returns.

The findings of this paper are related to a recent line of inquiry on the implications of corporate disclosures on a firm's cost of *equity* capital and its components. Welker (1995) documented a negative association between the financial analysts' disclosure measure and a component of the cost of equity capital—the bid-ask spread set by market makers. Botosan (1997) explored the association between disclosures in annual reports for the machinery industry and a firm's cost of equity capital. She found a negative association between the disclosure measure and the cost of equity capital for firms with low analyst following, but the results did not extend to firms with high analyst following.

This study extends the investigation of the consequences of disclosure quality by providing evidence of a link between disclosure quality and the cost of *debt* capital. Although previous studies have not explored this relation, the issue is important because debt financing is the predominant form of external financing for publicly traded firms in the U.S. For example, during 1992, publicly traded companies raised approximately \$2,764 billion through investment grade debt issue (which excludes mortgage and government-backed debt, convertible debt and junk bonds) in comparison to approximately \$932 billion raised through common and nonconvertible preferred stock issue.³ The results here, combined with those of prior studies, suggest that disclosure quality influences the cost of both debt and equity capital. Thus, the consequences of disclosure quality are broader than a focus on equity issues alone could reveal.

The paper is organized as follows. Section II develops the hypotheses to be tested, section III discusses the research methodology, section IV describes the sample, section V reports the results and section VI summarizes the conclusions and inferences.

II. HYPOTHESIS DEVELOPMENT

Research on corporate behavior generally indicates that managers have better information than outsiders about the firm's past and future economic performance. While management releases information to the market through a number of sources including annual and quarterly reports, press releases and financial analysts, these provide, at best, a noisy

² In 1989 the Financial Analysts Federation (FAF) combined with the Institute of Chartered Financial Analysts (ICFA) to form the Association for Investment Management and Research (AIMR). Thus, from 1990 onwards, the corporate disclosure evaluations were published by AIMR under the new title: Corporate Information Committee Report (CICR). The evaluations, however, are still prepared by a committee of the FAF.

³ Information on aggregate debt and equity issues was obtained from the January 11, 1993 issue of the *Investment Dealers' Digest*.

signal about the firm's current and future economic performance. Individual investors and financial institutions, when lending money to these corporations, try to assess the default risk of the firm based on all available information. Underwriters similarly incorporate default risk estimates in their fees. One of the factors likely to enter into the default risk calculations is the probability that the firm is withholding value-relevant unfavorable information.⁴ The larger this probability (as assessed by the lender and underwriter), the larger the risk premium they would charge the firm.

In order to assess the likelihood that firms may be withholding adverse information, lenders and underwriters could look at past corporate disclosures. Factors likely to be important in making this assessment are the degree of detail and clarity in annual and quarterly reports, the accessibility of top management for discussion with financial analysts and the frequency of press releases. Firms consistently scoring high in these respects could be considered to have acquired a reputation for making timely disclosures. Lenders and underwriters then attach a lower probability that these firms, generally withhold adverse private information and will consequently charge them a lower risk premium. This leads to the first hypothesis:

H1: A firm's incremental cost of issuing debt is inversely related to the quality of its disclosures.⁵

The second hypothesis examines whether lenders' and underwriters' reliance on disclosure quality is dependent on market conditions. It may be argued that in situations where there is high market uncertainty about a firm's future, as reflected in the volatility in stock returns, traditional ratios used to estimate default risk, such as leverage and profitability, may be less informative about default risk. In this case, lenders and underwriters may rely more heavily on corporate disclosure quality in their default risk calculations. This leads to the second hypothesis:

H2: The relation between the quality of disclosures and the incremental cost of debt issue is stronger (weaker) for firms that are characterized by high (low) market uncertainty.

III. METHODOLOGY

The impact of corporate disclosures on a firm's cost of debt is examined using the following model:

$$\text{COD}_{t+1} = f(\text{DISC}_t, \text{Control Variables}) \quad (1)$$

where COD_{t+1} is the cost of debt issued in year $t + 1$ and DISC_t is a measure of disclosure quality over a period of years ending in year t . These variables and the control variables are discussed below.

Measures of Cost of Debt (COD)

The following two proxies are used to measure COD_{t+1} :

⁴ Unfavorable information in this context is defined as information that would increase the default risk of the firm.

⁵ While the content of any *specific* disclosure can cause lenders and underwriters to either increase or decrease their estimates of default risk, the focus of this study is the *overall* disclosure efforts of a firm over a number of years.

YIELD = yield to maturity on the first debt issue of year $t + 1$. This represents the effective rate of interest that equates the present value of the principal and interest payments with the amount paid by the lender.

ICOST = total interest cost to the firm on its first debt issue of year $t + 1$. This represents the effective rate of interest at which the present value of the principal and interest payment is equal to the amount *received* by the firm, net of underwriter discounts.

ICOST captures the effective incremental borrowing cost of a firm as it is based on the actual amount received by the firm. It thus includes the risk premium charged by both the bondholders and underwriters. The YIELD measure is also included because it captures the risk premium charged by bondholders, which is the largest component of a firm's cost of debt. While DISC is expected to be negatively associated with both measures of cost of debt, if both bondholders and underwriters use corporate disclosures in their default risk estimates, DISC would have a stronger association with ICOST (as compared to that with YIELD).

Data on YIELD and ICOST were primarily collected from the various issues of *Moody's Bond Survey* (Moody's Investor Service 1989–93). In some cases *Moody's* did not have ICOST information in which case these were collected (whenever available) from issues of *Investment Dealers' Digest* (Investment Dealers' Digest, Inc. 1989–93).

The Disclosure Quality Measure (DISC)

A measure of a firm's overall disclosure quality is obtained from the annual volumes of the *Report of the Financial Analysts Federation Corporate Information Committee* (FAF 1987–91).⁶ Currently published by Financial Analysts Federation (FAF) branch of the Association for Investment Management and Research (AIMR), each annual volume provides summary evaluations of disclosure practices for a sample of firms, based on their aggregate disclosure efforts over a fiscal year. Firms are evaluated on their disclosures through annual reports, quarterly reports, proxy statements, other published information such as press releases and fact books, and direct disclosures to the analysts in the form of meetings and responses to analyst inquiries. Analysts evaluate the timeliness, detail and clarity of information presented. Based on the evaluation, each firm is typically assigned a score (out of 100 possible points) on their total disclosure efforts. Separate scores for different disclosure categories, such as annual reports, quarterly reports and other public releases and discussion with financial analysts, are also often provided.

The evaluations are performed by subcommittees of leading analysts specializing in a particular industry. Each subcommittee decides first on the firms to be examined and the scoring process. Subsequently, each committee member evaluates all the firms selected within that industry. Finally, the committee meets to summarize and report the scores. Typically, the firm receiving the highest score is given an Award of Excellence or a Letter of Commendation. To ensure comparability of the scores across industries, the FAF provides a detailed checklist of criteria to be used for scoring the firms and guidelines for the weights to be used for different disclosure categories. Each year 400–500 firms are evaluated by the FAF. The set of firms selected remains fairly stable from year to year. An average of 13 analysts are on an industry sub-committee.

The FAF scores include disclosures from all sources considered to be important by financial analysts. Because lenders and underwriters are likely to examine all corporate

⁶ See Lang and Lundholm (1993, 1996) for a detailed description of this disclosure data.

disclosures in their default risk calculations, the FAF scores are an appropriate measure of disclosure quality in the context of this study.

A potential drawback of the FAF scores is that they are based on analysts' perceptions of corporate disclosure practices. Thus, biases and errors in analysts' judgments may affect the scores. However, the FAF has set up numerous procedures to minimize the impact of such biases or errors. First, the FAF reports only the average scores (across industry analysts) reducing the impact of errors and incentives of individual analysts to deliberately, or involuntarily, bias the scores to improve analyst-management relationships. Second, the FAF provides detailed guidelines and a comprehensive checklist of criteria to help standardize the ratings process both within and across industries. Third, each analyst evaluating a firm is an expert in that specific industry which reduces the chances of errors.

Recent studies using the disclosure scores generally indicate that the scores are reasonable proxies for asymmetry of information in the market. Lang and Lundholm (1993) document a negative association between the scores and analyst forecast errors and the standard deviation of stock returns. Farragher et al. (1994) and Lang and Lundholm (1996) document a significant negative association between the disclosure scores and dispersion of security analysts' earnings-per-share forecasts, while Welker (1995) documents a negative relation between the disclosures scores and the bid-ask spread set by the market makers.

Lenders and underwriters are expected to examine past disclosures to make default risk estimates. Consequently, in this study the disclosure metric DISC is taken as the average of the total disclosure score of a firm over three consecutive years (years t , $t - 1$ and $t - 2$).⁷

The Control Variables

The control variables were selected based on a survey of prior research on the determinants of corporate and municipal bond ratings and yields (e.g., Fisher 1959; Jaffee 1975; Sorensen 1979; Boardman and McEnally 1981; Kidwell et. al 1984; Wilson and Howard 1984; Fung and Rudd 1986; Lamy and Thompson 1988; Feroz and Wilson 1992; Ziebart and Reiter 1992). These studies typically explain the cost of a debt issue in terms of issuer characteristics (default risk), issue characteristics (such as size, maturity and special features of the debt) and macroeconomic conditions (market rate of interest, stage of the economic cycle, etc.). Based on these studies, the following control variables were included to proxy for issue characteristics and market conditions.

Issue Characteristics

LSIZE = log of the size of issue (in millions of dollars). Economies of scale in underwriting suggest that the cost of debt measures would be inversely related to LSIZE.

LMATUR = log of years to maturity. Bonds with longer maturity are expected to have a higher YIELD and ICOST because of its greater (interest) risk exposure.

CALL = the ratio of the years to first call divided by the years to maturity. This variable takes the value of 1 if there is no call and 0 if it is callable from the date of issue. The issuer is expected to pay a penalty for the call provision, which indicates that CALL will be negatively associated with YIELD and ICOST.

⁷ Analysis was also performed using two-year averages of the scores and these were similar to those reported in the paper.

CONVERT = 1 if the bond is convertible, 0 otherwise. Convertible bonds are expected to have a lower YIELD and ICOST.

SUBORD = 1 if the debt is subordinated, 0 otherwise. Subordinated debt is expected to have a higher YIELD and ICOST.

Market Conditions

TBILL = yield on constant maturity U.S. Treasury bill of approximately equal maturity on the date of issue.⁸ The higher this Treasury bill rate the higher is YIELD and ICOST.

BC = Average yield on Moody's Aaa bonds for the month of issue less the average yield on 30-year U.S. Treasury bill for the month of issue. This variable is expected to capture the time series variation in risk premium over the business cycle. The larger this differential, the higher is the expected YIELD and ICOST.

Prior research on the determinants of YIELD and ICOST has typically used bond ratings as an overall measure of the default risk of a firm. This study, however, is based on the argument that disclosures are used in default risk calculations. In fact, Standard & Poor's (1982, 25) states that it assesses the quality of accounting disclosures when it assigns a rating to a bond issue. This suggests that once the ratings are included as a control variable in equation (1), the incremental effect of corporate disclosures is not likely to exist. To deal with this problem, an alternative set of control variables was included to proxy for the issue characteristics of a firm based on the literature on the determinants of corporate bond ratings.⁹

Issuer Characteristics

DE = book value of long term debt divided by the market value of common equity at the end of year t . Firms with higher debt to equity ratio are expected to have higher YIELD and ICOST.

MARGIN = income before extraordinary items divided by net sales of year t . Firms with higher profit margin are expected to enjoy lower YIELD and ICOST.

TIMES = the sum of income before extraordinary items and interest expense, divided by interest expense, all for year t . Firms with higher times-interest-earned ratio are expected to enjoy lower YIELD and ICOST.

LASSET = log of total assets at the end of year t . Larger firms are expected to enjoy lower YIELD and ICOST because of their lower market risk.

STDRETN = standard deviation of daily stock returns over year t . This is a proxy for the market risk of the issuer so that it is expected to be positively associated with YIELD and ICOST.

Some sensitivity analysis is conducted to evaluate the impact of selecting these control variables as compared to the bond ratings and this is discussed in section V.

⁸ Treasury bill rates were obtained from the Federal Reserve Database (FRED). These represent daily averages of the constant-maturity yield on U.S. Treasury bonds. If the maturity period of a corporate bond did not exactly match that of a Treasury bond, yield data was matched with the Treasury bond with the closest maturity.

⁹ See for example, Horrigan (1966), West (1970), Kaplan and Urwitz (1979) and Ziebart and Reiter (1992).

The following regression is then estimated:¹⁰

$$\begin{aligned} \text{COD} = & \alpha_0 + \alpha_1 \text{DISC} + \alpha_2 \text{DE} + \alpha_3 \text{MARGIN} + \alpha_4 \text{TURNS} + \alpha_5 \text{LASSET} \\ & + \alpha_6 \text{STDRETN} + \alpha_7 \text{LSIZE} + \alpha_8 \text{LMATUR} + \alpha_9 \text{CALL} + \alpha_{10} \text{CONVERT} \\ & + \alpha_{11} \text{SUBORD} + \alpha_{12} \text{TBILL} + \alpha_{13} \text{BC} + \varepsilon \end{aligned} \quad (2)$$

where:

$$\text{COD} = \text{YIELD or ICOST.}$$

The expected signs of the coefficients are: $\alpha_1 < 0$, $\alpha_2 > 0$, $\alpha_3 < 0$, $\alpha_4 < 0$, $\alpha_5 < 0$, $\alpha_6 > 0$, $\alpha_7 < 0$, $\alpha_8 > 0$, $\alpha_9 < 0$, $\alpha_{10} < 0$, $\alpha_{11} > 0$, $\alpha_{12} > 0$ and $\alpha_{13} > 0$.

Tests of the second hypothesis relating to the strength of the relationship between DISC and COD are performed by dividing the sample into two groups based on the medial value of STDRETN. The impact of disclosures is expected to be stronger for the high STDRETN group, as compared to the low STDRETN group. If α^H_1 and α^L_1 represent the coefficients for the DISC variable in regression (2) for the high STDRETN and low STDRETN groups respectively, it is expected that $(\alpha^H_1 - \alpha^L_1) < 0$. To test for the difference in the coefficient across the two groups, a dummy variable DIFF is created, such that:

$$\begin{aligned} \text{DIFF} &= \text{DISC for the high STDRETN group,} \\ &= 0 \text{ for the low STDRETN group.} \end{aligned}$$

Under this specification, the coefficient for DIFF represents the slope difference $(\alpha^H_1 - \alpha^L_1)$. The following regression is then run to test for the difference in the effect of disclosure quality across the two groups:

$$\begin{aligned} \text{COD} = & \alpha_0 + \alpha^L_1 \text{DISC} + (\alpha^H_1 - \alpha^L_1) \text{DIFF} + \alpha_2 \text{DE} + \alpha_3 \text{MARGIN} + \alpha_4 \text{TURNS} \\ & + \alpha_5 \text{LASSET} + \alpha_6 \text{STDRETN} + \alpha_7 \text{LSIZE} + \alpha_8 \text{LMATUR} + \alpha_9 \text{CALL} \\ & + \alpha_{10} \text{CONVERT} + \alpha_{11} \text{SUBORD} + \alpha_{12} \text{TBILL} + \alpha_{13} \text{BC} + \varepsilon. \end{aligned} \quad (3)$$

The expected signs of the coefficients are: $\alpha^L_1 < 0$, $(\alpha^H_1 - \alpha^L_1) < 0$, $\alpha_2 > 0$, $\alpha_3 < 0$, $\alpha_4 < 0$, $\alpha_5 < 0$, $\alpha_6 > 0$, $\alpha_7 < 0$, $\alpha_8 > 0$, $\alpha_9 < 0$, $\alpha_{10} < 0$, $\alpha_{11} > 0$, $\alpha_{12} > 0$ and $\alpha_{13} > 0$.

IV. SAMPLE SELECTION AND DESCRIPTION

The sample selection process is summarized in table 1. Data on the total disclosure score for companies were obtained from the 1987–1991 annual volumes of the FAF reports. In order to make the scores comparable across industries, each score was converted to a percentage of total available points for that industry. A few industries that did not provide information on total scores or total available scores were dropped. Banking and insurance industries were also eliminated as their financing decisions are affected by somewhat different factors than those of the industrial firms. This yielded a potential sample of 1,704 firm-year observations covering 532 different firms. Finally, the scores of each firm were averaged over three consecutive years (years t , $t - 1$ and $t - 2$) to obtain the disclosure metric (DISC) capturing a firm's current and past corporate disclosure efforts. Firms that

¹⁰ Firm and time subscripts are not shown. The time orientation of each variable is included as part of that variable's definition.

did not have three consecutive years' of information were deleted in the process, yielding an initial disclosure sample of 725 firm-years (311 different firms).

The disclosure sample was then matched with bond issue information collected from various issues of *Moody's Bond Survey* and *Investment Dealers' Digest*. DISC_t (reflecting the average of the total scores for period t , $t - 1$ and $t - 2$) was matched with the first debt issue for the period $t + 1$. Firms that did not have a debt issue in the relevant year were deleted, resulting in a sample of 226 firm-year observations and 143 firms with yield to maturity information (200 firm-year observations and 132 firms with ICOST information).

A careful examination of the disclosure sample revealed that the issuer characteristics (LSIZE, DE, MARGIN, etc.) and the disclosure quality (DISC) of a firm remain fairly stable over time. The high autocorrelation in these variables suggests that regression results using multiple observations of a firm would violate the assumption of independence of observations and overstate the t -statistics. The primary objective of this research is to explain the *cross-sectional* variation in the cost of debt, so only one observation per firm (the latest year's observation) was retained.

Compustat or CRSP information needed to compute some of the control variables were not available for 29 firms, so that the final sample for the analysis involving YIELD consisted of 114 firms while 103 firms were available for regressions involving ICOST.

Table 2 shows the mean FAF scores by industry in the YIELD sample. The table shows that the data spans 15 industries. The number of firms within an industry group range from 3 (for aerospace and nonferrous metals and mining) to 16 (for retail trade). The data also reveals variation in the average disclosure scores across industries. Thus, the average score for the retail trade industry is 92.67 while that for nonferrous metals and mining is only 49.98. While disclosure practices could vary substantially across industries, inter-industry differences in disclosure scores could also arise because different groups of analysts evaluate different industries. One way to deal with this problem is to adjust all variables by subtracting out their industry mean (Lang and Lundholm 1993, 1996). This method, however, eliminates possible variation in disclosure practices across industries. Hence, Welker (1995) used the raw disclosure scores for his analysis. Following Welker (1995), the reported analysis in this paper is based on raw scores. A separate analysis was also performed

TABLE 1
Summary of Sample Selection Screens

<i>Selection Criteria</i>	<i>Number of Firms</i>
Firms with disclosure scores*	599
Less:	
Financial institutions	(67)
Firms which did not have three consecutive years' scores	(221)
Firms which did not have a matching bond issue	(168)
Firms lacking Compustat and CRSP information	(29)
Final sample for regressions with yield to maturity (YIELD)	114
Firms lacking underwriter discount information	(11)
Final sample for regressions with total interest cost (ICOST)	103

* Disclosure scores were taken from the *Report of the Financial Analysts Federation Information Committee* (FAF 1987-91).

TABLE 2
Average Disclosure Scores by Industry*
Firms in the YIELD Sample (114 observations)

<i>Industry</i>	<i>Number of Firms</i>	<i>Average Score</i>	<i>Industry</i>	<i>Number of Firms</i>	<i>Average score</i>
Aerospace	3	69.38	Machinery	7	72.81
Airline	5	74.73	Media	8	65.39
Chemical	7	76.19	Nonferrous metals and mining	3	49.98
Diversified companies	4	83.11	Oil—Domestic and refineries	4	83.75
Electrical	5	80.89	Paper and forest products	15	65.40
Food, beverage and tobacco	14	68.56	Railroad	5	83.53
Natural gas pipeline	9	74.49	Retail trade	16	92.67
Health care	9	82.44			

* Disclosure scores were taken from the *Report of the Financial Analysts Federation Information Committee* (FAF 1987–91).

using scores adjusted for industry means. These untabulated findings (available upon request) are consistent with the results reported in the paper.

V. RESULTS

Descriptive Statistics and Correlation Analysis

Panel A of table 3 presents some sample statistics of key variables. The table shows that the median disclosure score is 76.38. There is considerable dispersion in the scores, as represented by the minimum and maximum values of 43.83 and 96.37 respectively, and the standard deviation of 12.43. The table also reveals that the sample consists primarily of larger firms with median assets of about \$6 billion. However, there is a wide range of variation within the sample as indicated by the minimum and maximum values. YIELD and ICOST also seem to vary quite a bit across firms. Thus, the lowest YIELD is only 4.5 while the highest YIELD is 11.74.

A preliminary idea of the association between DISC and the cost of debt measures can be obtained by looking at the simple (Pearson) correlations between variables presented in table 4. The table reveals that DISC is negatively correlated with both YIELD and ICOST and the correlation coefficients are statistically significant at the 0.05 level.

Association Between Disclosure Quality and Bond Ratings

Before proceeding to tests of the association between disclosure quality and the cost of debt measures, it is instructive to regress bond ratings against the disclosure measure and the control variables specified earlier in the form of the following regression:

$$\begin{aligned}
 \text{RATE} = & \beta_0 + \beta_1 \text{DISC} + \beta_2 \text{DE} + \beta_3 \text{MARGIN} + \beta_4 \text{TIMES} + \beta_5 \text{LASSET} \\
 & + \beta_6 \text{STDRETN} + \beta_7 \text{LSIZE} + \beta_8 \text{LMATUR} + \beta_9 \text{CALL} \\
 & + \beta_{10} \text{CONVERT} + \beta_{11} \text{SUBORD} + v
 \end{aligned}
 \tag{4}$$

where RATE takes the values 1 through 6 representing Moody's bond ratings of Aaa, Aa,

TABLE 3
Summary Statistics and Variable Definitions

Panel A: Summary Statistics

<i>Variables</i>	<i>Number</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Median</i>	<i>Minimum</i>	<i>Maximum</i>
YIELD	114	8.20	1.32	8.36	4.50	11.74
ICOST	103	8.41	1.58	8.48	4.73	17.00
DISC	114	75.64	12.43	76.38	43.83	96.37
DE	114	0.53	0.54	0.37	0.001	2.95
MARGIN	114	0.04	0.06	0.04	-0.22	0.23
TIMES	114	3.66	5.17	2.52	-0.99	44.76
ASSET*	114	100.71	174.37	60.23	10.21	1538.84
STDRETN	114	0.02	0.004	0.02	0.01	0.04
SIZE*	114	202.60	118.55	198.54	49.88	700.00
MATUR*	114	15.18	9.83	10.00	2.00	30.00
TBILL	114	7.29	0.84	7.37	3.83	9.00

Panel B: Variable definitions

YIELD = yield to maturity on first debt issued in year $t + 1$.

ICOST = total interest cost (to the issuer) of the first debt issued in year $t + 1$.

DISC = average of total FAF disclosure score over the years t , $t - 1$ and $t - 2$.

DE = total liabilities at the end of year t divided by the market value of common equity at the end of year t .

MARGIN = income before extraordinary items of year t divided by net sales of year t .

TIMES = the sum of income before extraordinary items and interest expense of year t , divided by the interest expense, of year t .

LASSET = log of the book value of total assets at the end of year t .

STDRETN = standard deviation of daily stock returns over year t .

LSIZE = log of the dollar amount of the debt issued.

LMATUR = log of the number of years to maturity of the debt.

TBILL = yield on U.S. Treasury bonds of approximately equal maturity to that of the bond issue (on the debt of issue).

BC = average yield on Moody's AAA bonds for the month of issue minus the average yield on 30-year U.S. Treasury bills for the month of issue.

CALL = number of years to first call divided by the number of years to maturity.

CONVERT = 1, if the debt is convertible; 0 otherwise.

SUBORD = 1, the debt is subordinated; 0 otherwise.

DIFF = DISC for firms with STDRETN > 0.02, 0 otherwise.

RATE = 1,2,...,6 for bonds rated Aaa, Aa, A, Baa, Ba and B, respectively.

* ASSET, SIZE and MATUR information is provided only for sample characteristics. In the regressions, log of these values (LASSET, LSIZE and LMATUR, respectively) are used. ASSET figures are in \$100 million.

TABLE 4
Correlations Among Selected Variables*

	YIELD	ICOST	DISC	DE	MARGIN	TIMES	LASSET	STDRETN	LSIZE	LMATUR	CALL	TBILL
ICOST	0.855 (0.001)											
DISC	-0.203 (0.031)	-0.233 (0.018)										
DE	0.328 (0.001)	0.291 (0.003)	-0.161 (0.087)									
MARGIN	-0.268 (0.004)	-0.239 (0.015)	0.111 (0.238)	-0.515 (0.001)								
TIMES	-0.267 (0.004)	-0.205 (0.038)	0.081 (0.393)	-0.382 (0.001)	0.632 (0.001)							
LASSET	-0.117 (0.217)	-0.147 (0.138)	0.161 (0.087)	0.139 (0.142)	-0.018 (0.850)	-0.057 (0.549)						
STDRETN	0.172 (0.067)	0.153 (0.124)	0.017 (0.859)	0.393 (0.001)	-0.418 (0.001)	-0.161 (0.086)	-0.161 (0.087)					
LSIZE	-0.153 (0.103)	-0.178 (0.073)	0.097 (0.304)	0.011 (0.906)	-0.092 (0.329)	0.083 (0.383)	0.520 (0.001)	-0.045 (0.632)				
LMATUR	0.467 (0.001)	0.339 (0.001)	-0.001 (0.990)	-0.064 (0.498)	-0.197 (0.036)	-0.268 (0.004)	0.003 (0.975)	-0.145 (0.124)	-0.045 (0.634)			
CALL	-0.098 (0.301)	-0.089 (0.374)	-0.053 (0.576)	-0.114 (0.227)	0.094 (0.318)	0.071 (0.451)	-0.073 (0.442)	-0.049 (0.599)	-0.019 (0.842)	-0.207 (0.027)		
TBILL	0.688 (0.001)	0.625 (0.001)	-0.021 (0.826)	-0.095 (0.314)	-0.045 (0.634)	-0.118 (0.212)	-0.215 (0.021)	-0.137 (0.147)	-0.145 (0.124)	0.588 (0.001)	-0.033 (0.725)	
BC	0.207 (0.028)	0.194 (0.049)	-0.019 (0.839)	-0.185 (0.049)	0.114 (0.228)	-0.054 (0.570)	-0.066 (0.483)	-0.086 (0.362)	0.073 (0.438)	0.086 (0.364)	0.172 (0.067)	0.317 (0.001)

* p-values for two-tailed tests are provided in parentheses. Variables are defined in panel B of table 3.

A, Baa, Ba and B, respectively (there were no ratings below B in the sample) for the bond issue of year $t + 1$.

The purpose of this regression is twofold. First, much of the analysis in this paper rests on the argument that the default risk premium a firm pays is associated with its disclosure quality. Bond ratings are commonly used to measure a firm's default risk. Thus, a negative association between RATE and DISC in the presence of other control variables would provide support of the above argument. Second, regression (4) provides evidence on the extent to which the control variables selected (in lieu of bond ratings), capture the default risk of the firm.

Since RATE is an ordinal variable, regression (4) was estimated using a logistic model. The results, summarized in table 5, show that DISC is a statistically significant determinant of bond ratings as hypothesized. This suggests that rating agencies like Moody's examine a firm's disclosure quality in evaluating its debt rating and that the FAF scores are reasonable proxies for the disclosure quality implicit in bond ratings. The generalized R^2 for the regression is 0.66, indicating that the control variables selected explain a major portion of the variation in the bond ratings. Note that the coefficients of all control variables except CALL (β_9) have their expected signs. Among the ten control variables, six (three) have coefficients that are statistically significant at the 10 percent (2 percent) level.

Effect of Disclosure Quality on the Cost of Debt

The test of H1 is performed by running regression (2). The results are summarized in table 6. The Breusch and Pagan (1979) test for heteroscedasticity yielded χ^2 of 153.35 and 187.727 for the regressions with YIELD and ICOST, respectively, indicating that heteroscedasticity could be a problem in these regressions. Hence, the reported t-statistics are based on White's (1980) heteroscedasticity-corrected covariance matrix. The results support the cost of debt hypothesis for both measures of cost of debt. The coefficient of DISC is negative and statistically significant at the 0.05 level for both regressions. The results indicate a stronger association between DISC and ICOST (as represented by a larger absolute value of the coefficient) which captures the risk premium charged by both bondholders and underwriters. The evidence is consistent with the hypothesis that both bondholders and underwriters examine corporate disclosure policy in estimating the risk premium to charge. The magnitude of the coefficient for DISC indicates that a 1 percent increase in the disclosure measure results in approximately 0.02 percent reduction in the total interest cost of the firm. This implies that, other things remaining constant, the firm with the highest disclosure score in the sample (96.37) enjoys a total interest cost that is approximately 1.1 percentage points lower than the firm with the lowest disclosure score (43.83) in the sample. For the high disclosure firm, this translates into annual interest savings of over \$5 million on its \$500 million debt issue.

The control variables generally have their expected signs. The adjusted R^2 for the regression with YIELD was 0.75 while that with ICOST was 0.55. These numbers are comparable to those reported in prior studies on the determinants of bond yield and total interest cost, such as Fung and Rudd (1986, 639), Lamy and Thompson (1988, 597) and Ziebart and Reiter (1992, 268). Regression diagnostics revealed that multicollinearity could be a problem in the regressions since the condition numbers were in the range of 60–65 (see Belsley et. al. 1980). The correlations reported in table 4 showed that the variables LSIZE and LASSET have a correlation of 0.52, while MARGIN has a correlation of -0.52 with DE, 0.63 with TIMES and -0.42 with STDRETN. To deal with this problem, regressions were rerun after dropping LSIZE and MARGIN, but this did not affect the qualitative conclusions of the cost of debt hypothesis. A few other alternative specifications were also tried and they all resulted in the same conclusions.

TABLE 5
Logistic Regression of Bond Ratings on Disclosure Quality and Control Variables

$$\text{Model: } \text{RATE} = \beta_0 + \beta_1 \text{DISC} + \beta_2 \text{DE} + \beta_3 \text{MARGIN} + \beta_4 \text{TIMES} + \beta_5 \text{LASSET} + \beta_6 \text{STDRETN} \\ + \beta_7 \text{LSIZE} + \beta_8 \text{LMATUR} + \beta_9 \text{CALL} + \beta_{10} \text{CONVERT} + \beta_{11} \text{SUBORD} + v$$

<i>Variable</i>	<i>Predicted Sign</i>	<i>Coefficient estimate</i>	<i>Wald χ^2</i>	<i>Probability</i>
DISC (β_1)	—	−0.043	5.382	0.020
DE (β_2)	+	2.250	13.404	0.001
MARGIN (β_3)	—	−10.455	3.014	0.083
TIMES (β_4)	—	−0.351	6.268	0.012
LASSET (β_5)	—	−0.832	6.970	0.008
STDRETN (β_6)	+	108.900	3.321	0.068
LSIZE (β_7)	—	−0.460	0.825	0.364
LMATUR (β_8)	+	0.245	0.515	0.473
CALL (β_9)	—	0.090	0.013	0.911
CONVERT (β_{10})	—	−2.928	1.265	0.261
SUBORD (β_{11})	+	4.235	3.085	0.079

Generalized $R^2 = 0.66$

Likelihood ratio $\chi^2 = 121.457$ ($p = 0.0001$)

Number of observations = 114

Variables are defined in panel B of table 3.

Disclosure Quality, Market Uncertainty and Cost of Debt

The results of the tests for differences in the effect of disclosure quality on cost of debt between the high and low STDRETN groups are given in table 7. The tests are based on the regression model (3) where the coefficient of concern is DIFF, which represents the difference in the coefficient for disclosure between the high and low STDRETN groups. Table 7 shows that DIFF is negative and statistically significant at the 0.01 level for both measures of cost of debt. This supports the argument that lenders and underwriters rely more on corporate disclosure quality when the market is relatively uncertain about the firm's future. Although the coefficient for DISC indicates a weaker association between cost of debt measures and DISC (as compared to those reported in table 6) note that the coefficient for DISC in table 7 represents the effect of DISC for firms in the low STDRETN group only. Regression diagnostics suggested that multicollinearity could be a problem in this regression also, but the findings relating to H2 were robust to alternative choices of the control variables.

Regression results reported in tables 6 and 7 were tested for the presence of influential observations using procedures suggested by Belsey et al. (1980). These procedures identified a relatively large number of potentially influential observations (4–11 depending on the regression). While researchers often tend to delete influential observations, Belsey et al. (1980) suggest that rather than deleting these observations, their influence should be minimized. Welsch (1980) has proposed a bounded influence estimation method that runs

TABLE 6
Regression Results of the Effect of Corporate Disclosure Quality on Cost of Debt

$$\text{Model: } COD = \alpha_0 + \alpha_1 \text{DISC} + \alpha_2 \text{DE} + \alpha_3 \text{MARGIN} + \alpha_4 \text{TIMES} + \alpha_5 \text{LASSET} + \alpha_6 \text{STDRETN} \\ + \alpha_7 \text{LSIZE} + \alpha_8 \text{LMATUR} + \alpha_9 \text{CALL} + \alpha_{10} \text{CONVERT} + \alpha_{11} \text{SUBORD} \\ + \alpha_{12} \text{TBILL} + \alpha_{13} \text{BC} + \varepsilon$$

Variable	Predicted Sign	Estimated Coefficient (White's <i>t</i> -statistic)	
		COD = Yield to Maturity (YIELD)	COD = Total Interest Cos. ² (ICOST)
INTERCEPT (α_0)	?	-0.156 (-0.162)	1.242 (0.838)
DISC (α_1)	-	-0.012 (-1.864)*	-0.021 (-2.693)**
DE (α_2)	+	0.895 (4.621)**	0.800 (3.221)**
MARGIN (α_3)	-	0.782 (0.339)	-2.334 (-0.599)
TIMES (α_4)	-	0.004 (0.291)	0.023 (0.919)
LASSET (α_5)	-	-0.106 (-0.953)	0.019 (0.130)
STDRETN (α_6)	+	70.345 (2.550)**	59.475 (1.580)
LSIZE (α_7)	-	0.016 (0.087)	-0.312 (-0.901)
LMATUR (α_8)	+	0.176 (1.708)*	-0.103 (-0.312)
CALL (α_9)	-	-0.196 (-1.028)	-0.348 (-1.798)*
CONVERT (α_{10})	-	-2.450 (-4.644)**	-2.039 (-2.788)**
SUBORD (α_{11})	+	0.434 (2.973)**	0.506 (3.176)**
TBILL (α_{12})	+	1.050 (14.979)**	1.211 (6.469)**
BC (α_{13})	+	0.858 (1.936)*	0.990 (1.866)*
Adjusted R ²		0.75	0.55
Breusch-Pagan χ^2		153.350	187.727
Number of observations		114	103

* Statistically significant at 0.05 level based on a one-tailed test.

** Statistically significant at 0.01 level based on a one-tailed test.

Variables are defined in panel B of table 3.

a weighted least squares regression after assigning lower weights to the influential observations. Regressions (2) and (3) were re-estimated using this procedure and the results were qualitatively similar to those reported in tables 6 and 7.

VI. CONCLUSION

This paper documents a statistically significant negative association between a measure of a firm's overall disclosure quality and two alternative measures of a firm's incremental borrowing cost: (1) the yield to maturity and (2) the effective interest cost to the issuer. These findings support the argument that lenders and underwriters consider a firm's disclosure quality in their default risk estimates. Other things remaining constant, firms that are

TABLE 7
Regression Results of the Differential Impact of Disclosure Quality on Cost of Debt

$$\text{Model: } COD = \alpha_0 + \alpha^L_1 \text{DISC} + (\alpha^H_1 - \alpha^L_1) \text{DIFF} + \alpha_2 \text{DE}_t + \alpha_3 \text{MARGIN} + \alpha_4 \text{TIMES} \\ + \alpha_5 \text{LASSET} + \alpha_6 \text{STDRETN} + \alpha_7 \text{LSIZE} + \alpha_8 \text{LMATUR} + \alpha_9 \text{CALL} \\ + \alpha_{10} \text{CONVERT} + \alpha_{11} \text{SUBORD} + \alpha_{12} \text{TBILL} + \alpha_{13} \text{BC} + \varepsilon$$

Variable	Predicted Sign	Estimated Coefficient (White's <i>t</i> -statistic)	
		COD = Yield to Maturity (YIELD)	COD = Total Interest Cost (ICOST)
INTERCEPT (α_0)	?	-0.680 (-0.734)	0.687 (0.497)
DISC (α^L_1)	-	-0.006 (-1.186)	-0.015 (-2.235)*
DIFF ($\alpha^H_1 - \alpha^L_1$)	-	-0.009 (-3.608)**	-0.009 (-3.247)**
DE (α_2)	+	0.890 (5.057)**	0.777 (3.355)**
MARGIN (α_3)	-	0.336 (0.173)	-3.243 (-0.885)
TIMES (α_4)	-	0.001 (0.111)	0.023 (0.940)
LASSET (α_5)	-	-0.174 (-1.768)*	-0.045 (-0.341)
STDRETN (α_6)	+	121.560 (3.856)**	110,090 (2.937)**
LSIZE (α_7)	-	0.113 (0.626)	-0.231 (-0.705)
LMATUR (α_8)	+	0.210 (2.159)*	-0.088 (-0.274)
CALL (α_9)	-	-0.340 (-1.659)*	-0.495 (-2.267)*
CONVERT (α_{10})	-	-2.976 (-7.006)**	-2.626 (-4.131)**
SUBORD (α_{11})	+	0.714 (3.743)**	0.812 (3.590)**
TBILL (α_{12})	+	1.008 (14.694)**	1.185 (6.503)**
BC (α_{13})	+	0.907 (2.177)*	1.042 (2.034)*
Adjusted R ²		0.78	0.57
Breusch-Pagan χ^2		100.850	192.269
Number of observations		114	103

* Statistically significant at 0.05 level based on a one-tailed test.

** Statistically significant at 0.01 level based on a one-tailed test.

Variables are defined in panel B of table 3.

rated favorably by financial analysts for the degree of detail, timeliness and clarity of disclosures, are perceived to have a lower default risk and are rewarded with a lower cost of borrowing. Moreover, the results indicate that there is greater reliance on disclosures when the market uncertainty surrounding the firm is high. These results suggest that the cost of capital benefits arising from disclosure quality is not limited to the cost of equity capital. The fact that bond yields and interest costs reflect disclosure quality provides accounting researchers with another vehicle, besides equity returns, for gaining understanding of the components of disclosure quality.

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The Effects of Audit Risk and Information Importance on Auditor Memory During Working Paper Review

Geoffrey B. Sprinkle
University of Wisconsin-Madison

Richard M. Tubbs
University of Iowa

ABSTRACT: Prior research on auditors' memory for evidence encountered during working paper review suggests that auditors commit memory errors that could inhibit audit efficiency and effectiveness. The current study extends this line of research by examining whether two prominent features of the auditing environment, audit risk and information importance, affect the accuracy of auditors' memory and auditors' willingness to rely on memory. These issues were examined in an experiment in which auditors were required to review two working-paper areas (accounts) and, 24 hours later, recognize if information items had been present in the working papers and express how willing they would be to rely on their memory for each item. The results indicate that: (1) the accuracy of auditors' memories is positively related to the level of audit risk of the area and the degree of importance of an information item within the area; (2) the auditors' willingness to rely on memory is negatively related to the degree of information importance but not related to the level of audit risk of the area; and (3) the auditors' likelihood of referring back to the working papers is negatively related to the accuracy of auditors' memories, and this negative relationship increases with the degree of information importance. Collectively, these results suggest that audit risk and information importance altered auditors' cognitive activities during the review process in a manner that

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contributes to the effectiveness (e.g., better memory for more consequential evidence) and efficiency (e.g., less verification of more strongly remembered and less consequential evidence) of the audit.

Key Words: *Working paper review, Memory, Audit risk, Information importance.*

Data Availability: *Data gathered in this study are available from the authors upon request.*

I. INTRODUCTION

Auditing standards mandate that work performed by an assistant be adequately supervised (AICPA 1997, AU311.11). This supervision includes the review of working papers, the "records kept by the auditor of the procedures applied, the tests performed, the information obtained and the pertinent conclusions reached in the engagement" (AICPA 1997, AU339.03). The primary objectives of working paper review are to evaluate the adequacy of the assistant's work and the consistency between the audit results and the conclusions to be presented in the audit report (AICPA 1997, AU311.13).

In the last 20 years, several factors (e.g., increased litigation, greater self-regulation and quality control, a shift away from the use of multiple procedures to achieve the same audit objective to better control cost and assignment of greater responsibility to less experienced auditors) have led to increased reliance on the review process (Akresh et al. 1988, 27–28). Accordingly, an efficient and effective review process is a critical component of a successful audit. The objective of the present study is to obtain a better understanding of "reviewer cognition and the process by which task and contextual features result in purposeful modification of the various subtasks comprising the review process" for the eventual purpose of improving audit practice (Rich et al. 1997b, 16; also see Libby and Trotman 1993).

There are several reasons why memory processes are an important aspect of reviewer cognition related to working paper review. First, the auditor is unlikely to devote equal attention to all of the information in the working papers and, as a result, some information is likely to be more available in memory than other information. Second, either during or subsequent to working paper review, the auditor must often rely on memory for evidence previously encountered during the review process (e.g., Tan 1995). For example, in many situations during an audit (e.g., discussions about issues, reviews of other audit areas, report work and filling out financial disclosure checklists), an auditor must recognize whether a piece of information is consistent or inconsistent with previously encountered audit evidence. Thus, even when source documents and detailed working papers are available, an auditor must often rely on memory to assess the implications of current audit evidence (Moeckel and Plumlee 1989). In addition, in some cases it may not be feasible for the auditor to verify the validity of a piece of information in memory by referring back to source documents or working papers. Furthermore, even in situations where working papers are re-examined, memory often guides the search for pertinent information (Libby and Trotman 1993).

Relatively few previous studies have focused on the auditor's memory for evidence encountered during working paper review (e.g., Moeckel and Plumlee 1989; Moeckel 1990; Libby and Trotman 1993). Of these studies, Moeckel and Plumlee (1989) and Moeckel (1990) are most closely related to the current research. In both studies, auditors reviewed a set of working papers and, after one day's delay, responded to a recognition test. The Moeckel (1990) study focused on the effect of audit experience on recognition errors, and,

although experience effects were found, auditors at all levels of experience were found to commit recognition errors. In Moeckel and Plumlee (1989), auditors rated their confidence in their memories for each item on the recognition test. Their results demonstrated that "[g]enerally, auditors are at least as confident in their incomplete and inaccurate memories as they are in their accurate memories" (Moeckel and Plumlee 1989, 665); that is, "calibration of auditors' confidence in their recognition accuracy" (Moeckel and Plumlee 1989, 664) was absent.

Although both Moeckel and Plumlee (1989) and Moeckel (1990) identify weaknesses in auditors' recognition performance, the results of Moeckel and Plumlee (1989) are of particular concern for two reasons. First, the authors concluded that this "general tendency toward misplaced confidence could lead to poor judgments when the accumulation of evidence is finished and the auditor undertakes the formulation of an opinion on an account balance, an accounting cycle, or the financial statements taken as a whole" (Moeckel and Plumlee 1989, 665). Second, the lack of an association between accuracy and confidence suggests that auditors may not know when they need to verify the validity of information by referring back to the working papers. Therefore, the results have effectiveness and efficiency implications regarding the audit process.

The current study extends the research of Moeckel and Plumlee (1989) by examining how auditors' memory during working paper review is affected by two critical features of the audit environment not examined in the previous research. The first feature examined is the level of an area's (account's) audit risk prior to the review of the working papers (i.e., the risk that material misstatement remains undetected for the audit area prior to the review process).¹ The second feature examined is the degree of importance of a piece of evidence within a particular area of the working papers (i.e., the relevance of the piece of evidence to the review of the specific audit area as well as to other areas of the audit after controlling for the area's level of audit risk).² More specifically, we examine whether two aspects of memory performance, the accuracy of auditors' memory for information in the working papers and auditors' willingness to rely on memory, are affected by the level of audit risk of the area and the degree of importance of a piece of evidence within a particular area.

Both audit risk and information importance are posited to play strong moderating roles on memory for two reasons. First, the auditor is likely to have more accurate memories for information in higher risk areas and for information of greater importance because more attention is devoted to this information. Specifically, previous research suggests that (1) the time spent reviewing the working papers is affected by area risk level (Bamber and Bylinski 1987; Bamber et al. 1988), and (2) a reviewer more extensively examines and elaborates on information that is relevant to, and not peripheral to, the objective of the review (Rich et al. 1997a). Second, an auditor is likely to be less willing to rely on memory for higher risk areas and for information of greater importance because audit risk and information importance are factors that are likely to modify the auditor's preferences (payoffs) for

¹ The level of audit risk prior to the review is consistent with the Rich et al. (1997b, 17) concept of the "probability of undetected preparer error." Rich et al. (1997b, 18) indicate that the reviewer considers the probability of undetected preparer error before the review and consider it to be a function of inherent risk, control risk, and the likelihood of the preparer failing to detect client error.

² The objectives of a reading task determine the degree of importance that an individual attaches to pieces of evidence encountered while performing the task. This construct has been referred to as "task-based importance" (e.g., Schraw et al. 1993, 652) or "task-relevant importance" (e.g., Reynolds 1992, 348). Since a primary objective of working paper review is to "evaluate whether the results are consistent with the conclusions to be presented in the auditor's report" (AICPA 1997, AU 311.13), and "audit risk and materiality...need to be considered...in evaluating the results" (AICPA 1997, AU 312.01), it is likely that the risk and materiality implications of a piece of evidence affect its importance. That is, regardless of an area's overall level of audit risk, pieces of evidence within that area are likely to vary in their risk and materiality implications and, as a result, their importance.

relying on memory. In particular, when deciding on whether to rely on memory, the auditor must consider the benefit associated with verifying evidence vs. the cost associated with verifying evidence. While the cost of verification may be the same for both higher and lower risk areas and for both items of greater and lesser importance, it is probable that the benefit of verification is positively related to both the level of area audit risk and the level of information importance.

An experiment was constructed, with 28 experienced auditors serving as subjects, to determine if the audit environment (i.e., audit risk and information importance) affected auditors' recognition accuracy and auditors' willingness to rely on memory. Subjects were required to review two working paper areas (inventory and accounts receivable) of differing risk during a fixed time interval (two hours). Twenty-four hours later, subjects were presented with 80 items of information (which differed in importance) pertaining to the working papers that they had reviewed the previous day. For each item, subjects were asked to answer two questions to determine how much information they remembered from the working papers and how willing they would be to rely on their memory for each item.

The accuracy of auditors' memories was found to be positively related to the level of audit risk of the area and the degree of importance of a piece of information within the area. Furthermore, the auditors' willingness to rely on memory was found to be negatively related to the degree of information importance, but not related to the level of audit risk of the area. In addition, the auditors' likelihood of referring back to the working papers was found to be negatively related to the accuracy of auditors' memories, and this negative relationship increased with the degree of information importance. Collectively, these results are consistent with auditors altering their cognitive activities during working paper review in a manner that contributes to the effectiveness and the efficiency of the audit. For example, auditors' memory is stronger for evidence that appears to be more consequential to the effectiveness of the audit. In addition, less verification of evidence that is more strongly remembered and that appears to be of less consequence to the effectiveness of the audit is likely to facilitate audit efficiency.

The remainder of this paper is organized as follows. Section II first presents an overview of signal detection theory (SDT) because the theoretical framework for the hypotheses is partially based on SDT and the experiment employs the methods and measures of SDT. Four hypotheses and the literature upon which the hypotheses are based are then presented. Section III explains the methods that are employed to test the hypotheses. Section IV presents the results, and section V provides a discussion of the results.

II. BACKGROUND AND HYPOTHESES

Signal Detection Theory

A well-accepted idea in the psychology literature is that recognition memory is a type of signal detection and, therefore, that SDT applies to it (e.g., Egan 1958; Banks 1970). In fact, SDT can be considered a theoretical model of recognition memory (e.g., Klatzky 1980). For these reasons, the concepts and methods of SDT have been and are currently being used in applied and theoretical studies of recognition memory (e.g., Welford 1986; Snodgrass and Corwin 1988; Ratcliff et al. 1992; Glanzer et al. 1993).³ In its simplest form, SDT applies to those tasks in which an individual is confronted with a stimulus that belongs to one of two categories, and the individual must choose between one of two responses based upon that stimulus. One response is appropriate if the stimulus is from the first category, while the other response is appropriate if the stimulus is from the second category.

³ SDT and its methods have also been employed in previous accounting research unrelated to memory (Brown 1981, 1983; Blocher et al. 1986).

The difficulty is that the individual must choose a response in the face of imperfect knowledge about the true category of the stimulus. In the standard language of SDT, the stimulus is classified as either "signal" or "noise," and the individual should respond "yes" if the stimulus is "signal" and "no" if the stimulus is "noise." The following 2×2 matrix captures the four possible outcomes from this representation of a simple SDT situation:

		Response	
		Yes	No
Stimulus	Signal	Hit	Miss
	Noise	False Alarm	Correct Rejection

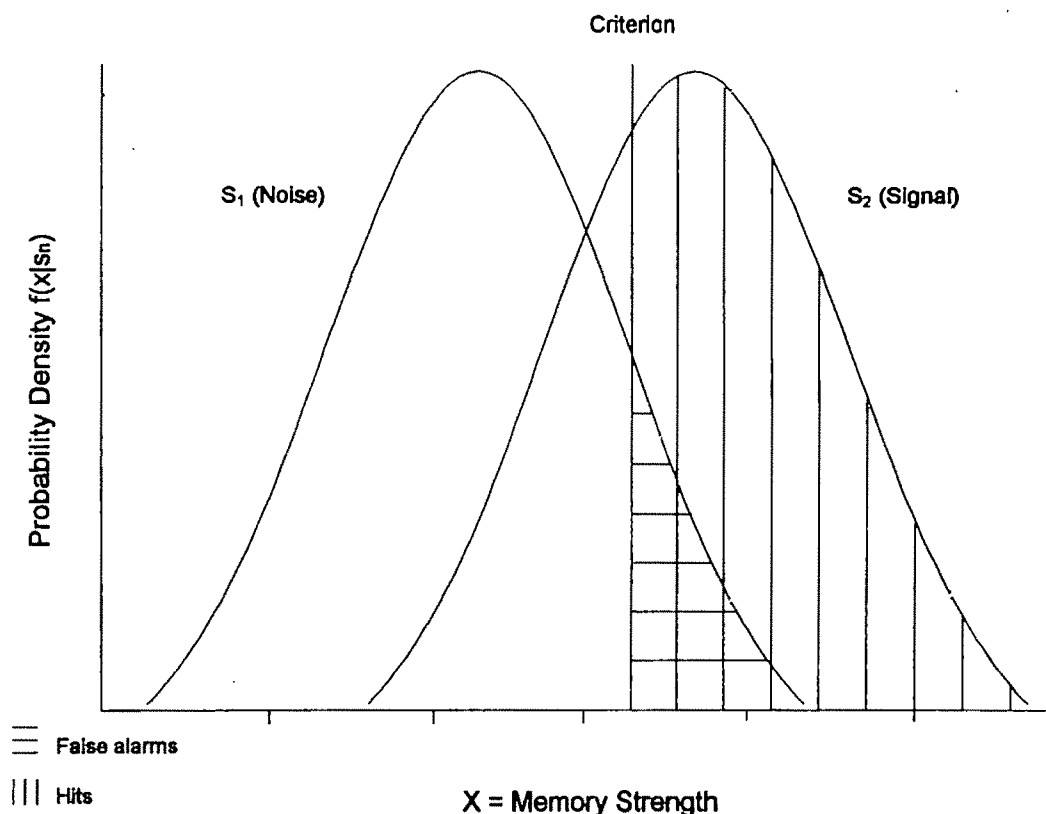
In the application of SDT to the recognition memory task of an audit reviewer, the stimulus corresponds to a specific piece of audit evidence. The stimulus is labeled "signal" if it corresponds to audit evidence previously encountered during the review of working papers, and it is labeled "noise" if it corresponds to evidence not previously encountered. When the stimulus—the piece of audit evidence—is observed, the reviewer has a certain level of memory strength or familiarity for that stimulus. SDT posits that the reviewer establishes a criterion on the memory strength continuum and will respond "yes" ("no") to the stimulus—meaning it has (has not) been previously encountered—if its memory strength is above (below) the criterion.⁴ Figure 1 displays an example of probability distributions of memory strength for stimuli that have not been previously encountered (S_1 : Noise) and for stimuli that have been previously encountered (S_2 : Signal) with one possible criterion. The fact that the mean of the signal distribution is to the right of the mean of the noise distribution indicates that, on average, evidence previously encountered has higher memory strength than evidence not previously encountered. The portion of the S_1 (S_2) distribution to the right of the criterion represents the false alarm (hit) rate (i.e., the false alarm rate is the number of "yes" responses to a "noise" stimulus divided by the number of "noise" stimuli). Similarly, the portion of the S_1 (S_2) distribution to the left of the criterion represents the correct rejection (miss) rate.

The distance between the noise (S_1) and signal (S_2) distributions on the memory strength continuum represents the reviewer's ability to discriminate between stimuli that represent noise and stimuli that represent signal. For example, if the noise and signal distributions are close together (far apart), then the reviewer has low (high) discrimination ability. The location at which a reviewer sets the criterion represents the reviewer's willingness to report "yes" or "no." For example, if the decision criterion is set at the point where the "hit rate" and "1 minus the false alarm rate" are equal (i.e., in figure 1, the intersection of the S_1 and S_2 distributions), the reviewer is neutral toward responding "yes" or "no." A decision criterion that is set above this point (positive bias) is a strict criterion where the reviewer is conservative about responding "yes." A decision criterion that is set below this point (negative bias) is a lenient criterion where the reviewer is liberal about responding "yes." The exact location of the criterion is presumed to be a function of (1) the prior probability of the stimulus being signal and (2) the values and costs associated with the various decision outcomes (Swets and Pickett 1982).

Figure 1 illustrates that the relative frequency of hits, misses, false alarms and correct rejections is not only a function of the reviewer's ability to discriminate (i.e., how far apart the S_1 and S_2 distributions lie) but also a function of where the criterion is set. For example,

⁴ The idea that memory strength exists on a continuum (i.e., it is not all-or-none) is well supported in the memory literature (see, for example, Klatzky 1980).

FIGURE 1
Illustrative Probability Density Functions of Noise and Signal Distributions
(One Criterion Included)



a stricter criterion in figure 1 would, *ceteris paribus*, reduce the frequency of false alarms but also reduce the frequency of hits. SDT separates recognition performance into two components—accuracy (the reviewer's capability in discriminating between stimuli) and decision criterion (the reviewer's willingness to report "yes" or "no"). Consequently, a primary benefit of SDT is that accuracy and decision criterion are independent constructs and the measure of accuracy is not confounded by an individual's choice of a criterion (Murdock 1965; Banks 1970; Swets 1992). Common non-SDT indices of accuracy, such as the percent of correct responses, do not separate accuracy from decision criterion. For example, two individuals with equal ability to discriminate but different willingness to report "yes" will typically have a different percent correct. However, SDT measures will indicate that the individuals are equal in accuracy but different in decision criteria. Therefore, non-SDT indices may preclude insight into the reasons that underlie differential recognition performance (e.g., Banks 1970; Gescheider 1985). In addition, measures like percent correct are likely to be statistically inefficient (even if decision criteria are distributed similarly across experimental conditions) and/or biased estimators of accuracy (if decision criteria are not distributed similarly across experimental conditions) (e.g., Swets and Pickett 1982; Swets 1986).

In summary, the methods and measures of SDT are particularly appropriate in studies of recognition memory in which the independent variables are expected to influence both accuracy and decision criterion. As will be discussed next, it is posited that audit risk and information importance will affect auditors' recognition accuracy (the retention-based aspect of recognition performance) and auditors' willingness to rely on memory (a decision-based aspect of recognition performance). The manner in which the SDT measures of recognition performance are obtained is discussed in the method section.

Accuracy

The professional auditing literature (e.g., Label and Arens 1984; Ernst & Young 1993; Price Waterhouse 1993) suggests that during the review of working papers auditors should allocate attention across audit areas (accounts) in accordance with the level of risk associated with each area prior to the review of that area. Specifically, the review of working papers related to lower risk areas requires less attention due to efficiency concerns, and the review of higher risk areas requires more attention due to effectiveness concerns. This extra attention may involve spending more time writing review notes, elaborating on evidence and/or evaluating evidence. In support of this view, prior research (Bamber and Bylinski 1987; Bamber et al. 1988) has documented that auditors report spending significantly more time reviewing the working papers in areas of higher risk relative to areas of lower risk (e.g., read vs. skim).

Previous psychology research has demonstrated that a reader of text attaches varying degrees of importance to different pieces of information within the text depending on what the reader "consider(s) to be most relevant to the task" (Schraw et al. 1993, 652). Extra attention is then devoted to pieces of information in proportion to their importance (Anderson 1982; Britton et al. 1986). Similarly, a reviewer of working papers is likely to attach varying degrees of importance to different pieces of information within the working papers for an audit area depending upon how relevant the piece of information is to the review of the current audit area, as well as to the review of other audit areas. That is, regardless of the level of risk associated with an audit area (e.g., even for a lower risk area), some pieces of information will be more important than others to the reviewer of the working papers. This is consistent with the position of Rich et al. (1997a) that during working paper review some information is "relevant" while other information is "peripheral" to the reviewer's objective of evaluating the preparer's conclusions and documentation.⁵ Extra attention would then be devoted to pieces of information in the working papers in proportion to their importance.

Information to which extra attention is paid is more accessible in memory (e.g., Hasher and Zacks 1979; Reynolds and Anderson 1982). For example, SDT measures of recognition accuracy for previously presented stimuli such as words or pairs of words have been shown to increase as the time allowed to study those stimuli increases (e.g., Ratcliff and Murdock 1976; Doshier 1984; Hirshman and Palij 1992). Thus, by devoting more attention to areas of higher risk and items of greater importance during working paper review, an auditor's subsequent retrieval of this information is likely to be facilitated.

The first two hypotheses suggest that the increase in attention that an auditor devotes to higher risk areas and items of greater importance will lead to an increase in the auditor's

⁵ For example, regardless of the level of risk associated with the inventory account, a reviewer is likely to attach a greater degree of importance to the item "the finished goods inventory was originally priced at wholesale" than the item "the analytical procedures working paper was signed off and dated" because the first piece of information is relevant to evaluating the preparer's conclusions regarding the inventory account (and possibly other areas of the audit) whereas the second piece of information is peripheral to that objective.

accuracy (the retention-based aspect of recognition performance) for information related to these areas and items.

H1: An auditor will have more accurate memory for information contained in areas in which audit risk is higher than in areas in which audit risk is lower.

H2: An auditor will have more accurate memory for information that is of greater importance than for information that is of lesser importance.

Willingness to Rely on Memory

As previously mentioned, efficiency considerations often dictate that not all evidence, whether previously encountered or not, will be verified through re-examination of audit working papers or source documents (Libby and Trotman 1993). Rather, it is likely that the auditor first decides whether the information is consistent with information that was actually contained in the working papers. Then, the auditor decides whether to take the time to refer back to the working papers in order to verify the truth or falsity of the information.

In deciding whether to refer back to the working papers, the auditor must consider the costs (i.e., the time involved with this extra work) and the benefits (e.g., higher quality audit, less exposure to financial statement error) associated with the verification of information. *Ceteris paribus*, as the costs associated with verification increase, the more willing an auditor would be to rely on memory. *Ceteris paribus*, as the benefits associated with verification increase, the less willing an auditor would be to rely on memory. Therefore, just as the SDT decision criterion is considered to be a function of the values and costs associated with the various decision outcomes, the auditor's willingness to rely on memory is considered to be a function of the values and costs associated with the verification of information.

Environmental and contextual features are likely to guide the auditor in his/her decision about whether to verify individual pieces of information. While the cost of verifying information is unlikely to be affected by the level of area risk or the level of information importance, the benefit of verifying information is likely to be positively affected by both the level of area risk and the level of information importance. For example, the cost of verifying "confirmations were not referenced to the confirmation control" by referring back to the working papers is probably equal to the cost of verifying "customer deposits were initially recorded as a credit balance to A/R." However, the benefit of verifying "customer deposits were initially recorded as a credit balance to A/R" is probably greater than the benefit of verifying "confirmations were not referenced to the confirmation control" because the consequences of being wrong about the former are likely to be greater.

Therefore, *ceteris paribus*, higher audit risk and greater degrees of information importance are likely to decrease the auditor's willingness to rely on memory (a decision-based aspect of recognition performance) for information encountered in the working papers. This leads to the third and fourth hypotheses to be tested:

H3: An auditor will be less likely to rely on memory for information contained in areas in which audit risk is higher than in areas in which audit risk is lower.

H4: An auditor will be less likely to rely on memory for information that is of greater importance than for information that is of lesser importance.

III. METHOD

Participants

A national-level accounting firm provided 28 subjects who had an average of 3.4 years of auditing experience. The experiment was conducted on two consecutive days while the auditors were attending company-wide "level four" training sessions at two sites.⁶ One or both of the authors were present at each site to administer the instruments. Subjects were told that their responses would remain anonymous. Subjects were randomly assigned to the experimental conditions both across and within training session sites.

Review Task

On the first day of the experiment, subjects were asked to perform a detailed review of the working papers for two areas (inventory and accounts receivable) from the audit of a medium-sized manufacturing/wholesaling firm during a two-hour time interval. Before beginning the review, each subject was given a set of instructions that contained background information about the firm and information regarding the risk associated with each area. Information was manipulated so that the level of audit risk prior to the review (cf. Rich et al. 1997b) would be higher for one area and lower for the other.⁷ The instructions stated that, as is the case on many audits, time is limited and two hours is probably inadequate to perform a comprehensive review of both areas. Therefore, subjects were instructed to allocate their time to the review of each area as they would on an actual audit and to make review comments accordingly. After reviewing the instructions, subjects rated their perception of the risk associated with the accounts receivable and inventory accounts on a ten-point scale where "1" was labeled "low risk" and "10" was labeled "high risk." Then, subjects were instructed to begin their review of the working papers and reminded that they only had two hours to review both areas and that they should keep track of their time spent on each area using a form that was provided. The order of area presentation was randomized across subjects, but subjects were free to review either area first. At the completion of the review, subjects were asked to hand in their time sheet, their risk assessment rating sheet, their review notes, the working papers and the instructions to the experimenter.

The working papers were developed for a "fairness" (or second level) review seminar by the continuing professional education group of the participating firm. Slight modifications were made to the working papers by the authors and a senior partner from the participating firm to equate the level of materiality for the two areas. Otherwise, the working papers were of equal length (24 pages for each area) and contained approximately the same amount of detail. None of the subjects had previously been exposed to any of the materials.

Recognition and Referral Task

Twenty-four hours after the review task, subjects performed a recognition and referral task.⁸ In the instructions for the second day, subjects were reminded that (1) in certain

⁶ Each session was a week long and started one week apart in separate midwestern cities.

⁷ For example, when A/R is the higher (lower) risk account: (1) the senior spends less (more) time on A/R than on Inventory, (2) the staff is in her first (second) year on the job and with the firm, (3) A/R has (has not) experienced major adjustments in the past, and (4) collection of A/R has (has not) been a problem in the past. All four factors should affect the perceived level of audit risk prior to the review, the first two through the likelihood of the preparer failing to detect client error and the last two through inherent risk.

⁸ While the subjects knew that they were going to continue the experiment on the second day, they did not know that they would perform a recognition task. It was felt that informing the subjects about the recognition task in advance of the review might limit the generalizability of the results. For example, the subjects might have attempted to memorize the information contained in the working papers rather than perform a standard working paper review.

situations during an audit, an auditor is presented with a piece of information that must be classified as either accurate or inaccurate; and (2) in situations like these, the auditor probably first decides whether the piece of information is consistent with information that was actually contained in the working papers previously reviewed. Next, the auditor probably decides whether to take the time to refer back to the working papers in order to verify the truth of the information. Subjects were then informed that they would be presented with 80 such pieces of information (items) which pertained to the accounts receivable and inventory working papers they reviewed the previous day. Furthermore, the instructions stated that approximately 50 percent of the items represented information actually contained in the working papers and 50 percent of the items represented information not contained in the working papers and/or contradicted information that was contained in the working papers. Since the effect of perceived values and costs on the decision criterion is a focus of the paper, prior probabilities were revealed so that subjects would set their decision criterion on the basis of their perceived values and costs of the various decision outcomes and not on their perceived prior probabilities. After the instructions, subjects were presented with 40 pieces of information related to one area followed by 40 pieces of information related to the other area. The order of area presentation and the order of item presentation within each area were randomized across subjects using eight different forms. Four levels of order of item presentation and two levels of order of area presentation were employed.

For each item, subjects were asked to answer two questions. First, subjects were asked to rate (on a five-point scale) their belief and their confidence in that belief about whether each item was true (i.e., the item refers to information that was actually contained in the working papers) or false (i.e., the item refers to information that was not contained in the working papers and/or contradicted information that was actually contained in the working papers). On the scale, "1" was labeled "Definitely, or almost definitely, true," "2" was labeled "Probably true," "3" was labeled "Possibly true," "4" was labeled "Probably false," and "5" was labeled "Definitely, or almost definitely, false." Second, subjects were asked to rate their belief about whether they would refer back to the working papers to verify the truth of each particular item. On the scale, "1" was labeled "Definitely, or almost definitely," "2" was labeled "Probably," "3" was labeled "Possibly," "4" was labeled "Probably not," and "5" was labeled "Definitely, or almost definitely, not."

The experimenters and an audit partner from the participating firm developed the items. Of the 40 items for each area, 20 of the items comprised information that was in the working papers and 20 of the items comprised information that was not in the working papers. In addition, of the 20 items that were in the working papers, ten of the items were classified as information that is more important to remember that it did occur and ten of the items were classified as information that is less important to remember that it did occur. Similarly, of the 20 items that were not in the working papers, ten of the items were classified as information that is more important to remember that it did not occur and ten of the items were classified as information that is less important to remember that it did not occur.⁹

⁹ For example, within A/R, the items "customer deposits were initially recorded as a credit balance to A/R" and "from prior year to this year, trade A/R decreased by more than \$50,000" were classified as information of greater importance, whereas the items "confirmations were not referenced to the confirmation control" and "the amount of income tax receivable was immaterial in the current year" were classified as information of lesser importance. Within Inventory, the items "subsequent purchase transactions showed that there were no significant declines in replacement cost" and "some of the dates on the inventory price test dated back to 1989" were classified as information of greater importance, whereas the items "the total book value of all items selected for the price test exceeded \$20,000" and "The CMA reconciliation amount agreed to the summary of inventory schedule" were classified as information of lesser importance.

The importance classifications were based upon the ratings of three audit partners and two managers from the participating firm who exhibited fairly high consensus (mean pairwise correlation = .4645,¹⁰ all pairwise correlations significant at $p \leq .0296$) in classifying the items. Raters were presented with 50 pieces of information (approximately 25 were true and approximately 25 were false) from each area. For each item, the partners and managers were asked to rate how important it would be for an auditor who had reviewed the working papers to remember later in the audit that the item actually was/was not present. A ten-point scale was used where "0" was labeled "Not important" and "10" was labeled "Very important." Within each category (i.e., accounts receivable true, accounts receivable false, inventory true, inventory false), the ten pieces of information with the lowest means were classified as information of lesser importance. Similarly, the ten pieces of information with the highest means were classified as information of greater importance. In the case of ties, items were rank-ordered by standard deviation and those items with the smallest standard deviation were selected. Over all items and categories, the mean rating for items of lesser importance was 4.5950 and the mean rating for items of greater importance was 7.8850. The differences are significant at $p < .0001$ for all categories within areas.

Design

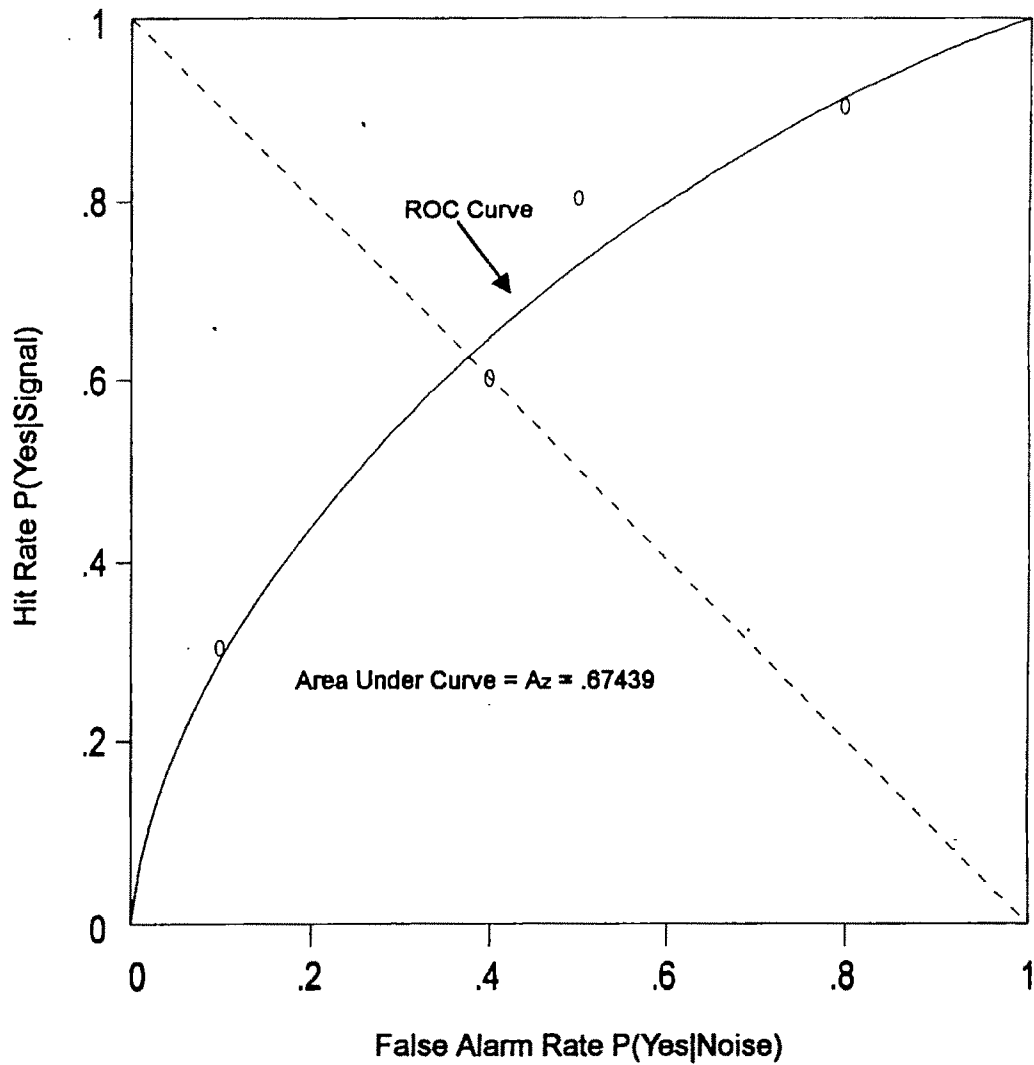
Three dependent variables (two of which are SDT measures) were used to test the hypotheses. As previously discussed, SDT measures are particularly appropriate in the current experiment because the independent variables are expected to influence both accuracy and decision criterion. The two SDT measures are based upon each subject's responses to the question about whether the items presented were in the working papers. These responses allow for the estimation of each subject's receiver-operating-characteristic (ROC) curve by means of the confidence-rating procedure (Gescheider 1985; Swets 1992).¹¹ An illustrative ROC curve based upon a particular subject in the experiment is presented in figure 2. Each sample point on the ROC graph represents the hit rate, false alarm rate pair associated with an assumed decision criterion of the subject. For example, the first observation in figure 2, the one closest to the origin, corresponds to the hit rate of .30 and the false alarm rate of .10 that would occur if the subject responded "yes" (the item is in the working papers) only when she categorized the item as a 1 ("definitely or almost definitely" in the working papers). The second observation in figure 2 corresponds to the hit rate of .60 and the false alarm rate of .40 that would occur if the subject responded "yes" whenever she categorized an item as a 1 or 2 and "no" whenever she categorized an item as 3, 4 or 5. By construction, ROC curves are monotonically increasing because they are based upon cumulative hit and false alarm rates and these rates cannot decrease as the threshold for responding "yes" becomes more lenient.

The area under the ROC curve, A_z , is a surrogate of accuracy. This measure is a probability score with a lower limit of 0 and an upper limit of 1, where .5 represents chance performance. A_z is the most widely accepted (e.g., Swets 1986, 196) measure of accuracy in SDT. It has the advantage (over alternative SDT accuracy indices) that it neither assumes that the signal and noise distributions are normally distributed nor that the distributions

¹⁰ The mean pairwise correlation is .5229 if only the 80 stimuli employed in the experiment are considered.

¹¹ The response scale used is recommended by Swets and Pickett (1982) for ROC curve estimation. The confidence-rating procedure is preferred in practice to the yes-no procedure because it yields more information about a single experimental condition, yields more reliable estimates of SDT parameters, and is more economical (Swets and Pickett 1982, 34).

FIGURE 2
Illustrative Receiver-Operating-Characteristic (ROC) Curve
(in the Context of a Memory Task)



O = Sample points from rating task.

have equal variances (Swets 1986, 183).¹² An ROC curve is estimated for each subject in each treatment combination of area risk level and importance.

Two independent surrogates for the willingness to rely on memory are employed to increase validity¹³ and enhance comparison with Moeckel and Plumlee (1989). The first surrogate for a subject's willingness to rely on memory is a signed distance metric, C_a , that stems from SDT. C_a is interpretable as a stringency-leniency index that is associated with each criterion value for each subject in each treatment condition. So, in our experiment four values for C_a for each subject in each treatment condition are calculated. Formally, C_a is the signed distance, in standard deviation units, between the minor diagonal in an ROC graph and each estimated point on the ROC curve. The minor diagonal is the broken line in figure 2 at which the hit rate equals the rate of correct rejections (i.e., 1 minus the false alarm rate). C_a can range from negative to positive infinity with points below (above) the minor diagonal being assigned positive (negative) values. Points below the minor diagonal (those assigned positive values) are points for which the hit rate is smaller than the rate of correct rejections. Thus, a positive C_a value indicates a tendency for that criterion to be strict (responses would be "no" relatively frequently), a zero value indicates a tendency for that criterion to be neutral and a negative value indicates a tendency for that criterion to be lenient (responses would be "yes" relatively frequently).

This background allows the relation between C_a and a subject's willingness to rely on memory to be explained. Recall that the rating scale used in the experiment ranges from 1 (item is definitely or almost definitely in the work papers) to 5 (item is definitely or almost definitely not in the workpapers). Intuitively, subjects who frequently classify items in the extreme categories of the rating scale are assumed to be more willing to rely on memory while subjects who frequently classify items in the middle categories are assumed to be less willing to rely on memory. For a given decision criterion and a given level of accuracy, the C_a for a subject who frequently classifies items in the extreme categories will be smaller in absolute value (on average across decision criteria) than for a subject who frequently classifies items in the middle categories (the middle categories indicate uncertainty about whether the item was previously encountered). In other words, on average, subjects who are less willing to rely on memory will have more extreme C_a values than subjects who are more willing to rely on memory.

Figure 3 provides an illustration of how C_a captures a subject's willingness to rely on memory. Figure 3 portrays the ROC curves of two subjects who have equal accuracy ($A_z = .5$) but portray different degrees of willingness to rely on their memory. The subject data that gives rise to these ROC curves is provided at the bottom of the figure. The triangles on the figure 3 ROC curve represent the hit and false alarm rate pairs at each of the four possible decision criteria for the subject who is less willing to rely on memory (the raw responses indicate that this subject is less inclined to respond in the extreme categories). The squares in the ROC curve represent the hit and false alarm rate pairs at each of the four possible decision criteria for the subject who is more willing to rely on memory (the raw responses indicate that this subject is more inclined to respond in the extreme categories). Figure 3 indicates that the calculated C_a values for the subject who is less willing

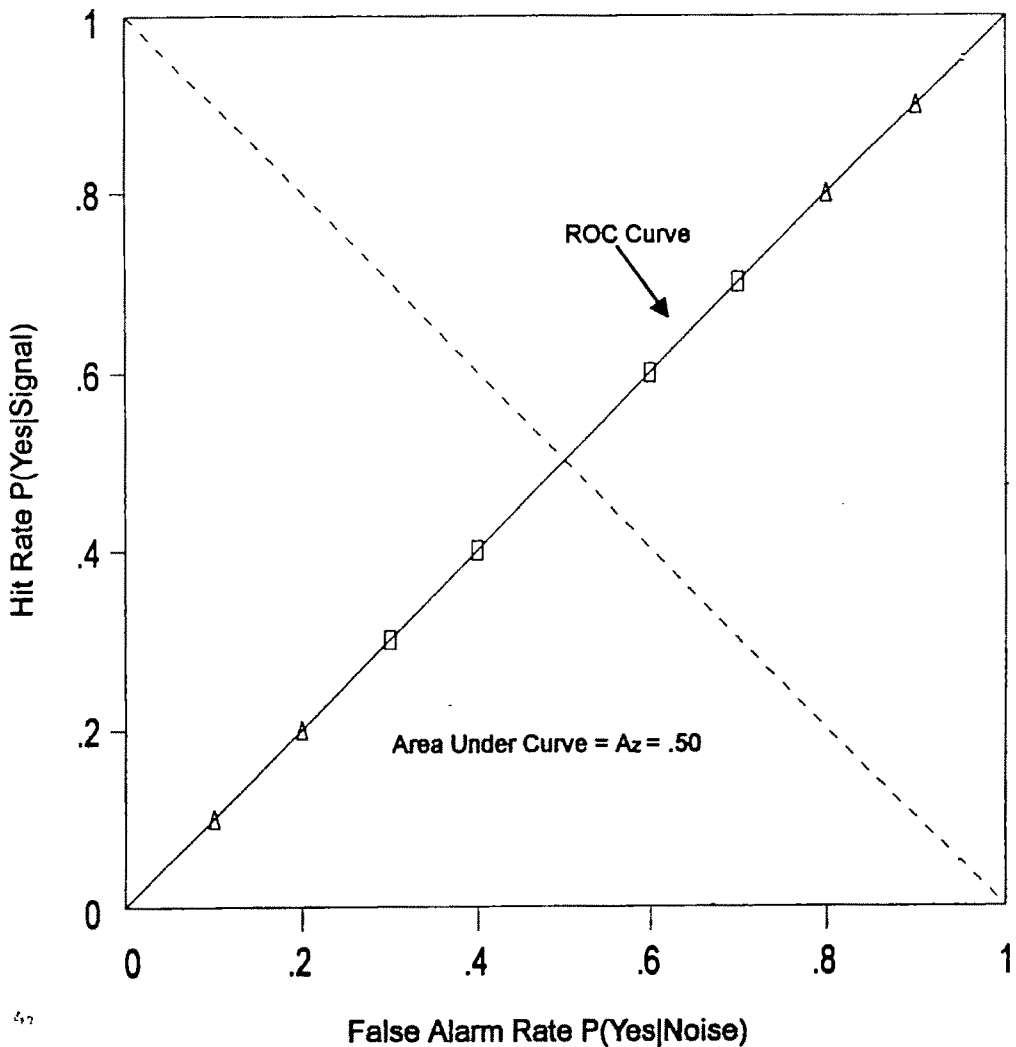
¹² Previous SDT research has consistently demonstrated that the signal and noise distributions are normally distributed with unequal variances (Swets 1986).

¹³ That is, if multiple independent surrogates for a construct are employed in testing hypotheses and the results converge, then we gain confidence that (1) the surrogates are proxying for the same underlying construct (see Campbell and Fiske 1959) and (2) the theoretical relationship is valid (see Brinberg and McGrath 1985). If multiple independent surrogates for a construct are employed in testing hypotheses and the results diverge, we also gain valuable information because a boundary condition has been identified (Brinberg and McGrath 1985).

to rely on memory are more extreme than for the subject who is more willing to rely on memory (i.e., the triangles are further from the minor diagonal than are the squares). An example of how the ROC curve is derived and A_z and C_a are calculated for one subject is presented in the appendix.

C_a has several advantages as a surrogate for a subject's willingness to rely on memory. C_a is statistically independent of accuracy, its range is independent of accuracy and it allows the signal and noise distributions to have unequal variances (Macmillan and Creelman 1991). In addition, this measure is attractive because it is based upon a formal theory of recognition and it can be calculated from the same responses as A_z (i.e., it is economical).

FIGURE 3
Illustrative ROC Curve for C_a



(Continued on next page)

FIGURE 3 (Continued)

		Rating Category					
<u>Less willingness to rely on memory:</u>		5	4	3	2	1	Total
Signal		1	1	6	1	1	10
Noise		1	1	6	1	1	10

		Rating Category					
<u>More willingness to rely on memory:</u>		5	4	3	2	1	Total
Signal		3	1	2	1	3	10
Noise		3	1	2	1	3	10

		Criterion ^a			
		4	3	2	1
C_{Δ} : Less willingness to rely on memory		-1.2816	-0.8416	0.8416	1.2816
$C_{\square}$: More willingness to rely on memory		-0.5244	-0.2534	0.2534	0.5244

Δ = Sample points from a subject who is less willing to rely on memory.

$\square$ = Sample points from a subject who is more willing to rely on memory.

^a The calculations here assume that the signal and noise distributions have the same variance. The formula for this case ($B=1$) is provided in the appendix.

The second surrogate for the willingness to rely on memory is the mean rating of the subject's responses to the second question in the recognition and referral task (i.e., the likelihood of referring back to the working papers) after controlling for the effect of A_{Δ} .¹⁴ The Likelihood of Investigation score has a lower limit of 1 and an upper limit of 5 and is estimated for each subject in each area risk level by importance treatment combination. This measure corresponds to the confidence rating scale employed by Moeckel and Plumlee (1989) and, therefore, allows comparison to prior research.

The experiment employs a $2 \times 2 \times 2 \times 2$ incomplete-block design. Three variables are manipulated within-subjects at two levels: area risk level (lower and higher), area (inventory and accounts receivable) and item importance (less important and more important). Block is manipulated between-subjects at two levels. The incomplete-block occurs because each subject received a set of working papers in which either (1) inventory was lower risk and accounts receivable was higher risk or (2) inventory was higher risk and accounts receivable was lower risk. In other words, each subject received only two of the four possible area risk level by area treatment combinations. This design was employed to avoid experimental confounding of area risk level and area (i.e., area is a control variable).

¹⁴ It is necessary to control for the effect of accuracy (i.e., A_{Δ}) because previous research (see, for example, Glenberg and Epstein 1985; Plous 1993) has demonstrated that confidence rating scales are unlikely to be independent of accuracy.

IV. RESULTS

Manipulation Checks

Inventory was the lower risk area and accounts receivable was the higher risk area for one group of subjects (Block 1), and inventory was the higher risk area and accounts receivable was the lower risk area for the other group (Block 2). Subjects' mean risk ratings by level of manipulated risk and area are presented in panel A of table 1. The least-squares mean¹⁵ risk rating of 8.9872 for the higher risk condition is greater than the least-squares mean of 4.6205 for the lower risk condition. Furthermore, this difference is statistically significant ($t = 10.9618$, $p = .0001$). Neither the effect of area ($F = 2.5277$, $p = .1239$) nor the interaction of risk and area ($F = 0.0003$, $p = .9858$) are statistically significant. In addition, the mean self-reported review time in hours that subjects allocated to each area and level of manipulated risk is presented in panel B of table 1. Subjects spent, on average, approximately 20 more minutes (out of two hours) on the area where level of manipulated risk was higher compared to the area where level of manipulated risk was lower. Furthermore, this difference in allocated review time is statistically significant ($t = 6.3269$, $p = .0001$). Neither the effect of area ($F = 0.0571$, $p = .8130$) nor the interaction of risk and area ($F = 0.4139$, $p = .5756$) are statistically significant. Therefore, risk appears to have been successfully manipulated.

¹⁵ A least-squares mean, or population marginal mean, is the arithmetic average of the population cell means for all cells comprising a particular level of a classification variable (i.e., the number of observations in each cell is ignored) (see Searle et al. 1980). For example, the least-square mean for the higher risk condition is the arithmetic average of the "Higher Risk—Inventory" cell mean and the "Higher Risk—A/R" cell mean in table 1.

TABLE 1
Manipulation Checks: Mean Risk Ratings and Mean Review Time

Panel A: Risk Ratings

Area	Risk		
	Lower	Higher	
Inventory	4.9333 n = 15 (Block 1)	9.3077 n = 13 (Block 2)	7.1205
A/R	4.3077 n = 13 (Block 2)	8.6667 n = 15 (Block 1)	6.4872
	4.6205	8.9872	

Panel B: Review Time in Hours

Area	Risk		
	Lower	Higher	
Inventory	0.7733 n = 15 (Block 1)	1.1538 n = 13 (Block 2)	0.9636
A/R	0.8077 n = 13 (Block 2)	1.1467 n = 15 (Block 1)	0.9772
	0.7905	1.1503	

A/R = Accounts Receivable.

Experimental Results

The following approach is employed in presenting the experimental results related to each dependent variable. First, the least-squares means associated with each hypothesis are given. Second, test statistics associated with the planned contrast of each hypothesis are indicated. If the least-squares means are in the predicted direction, then t-statistics and one-tailed p-values are presented. Otherwise, F-statistics and two-tailed p-values are presented. Finally, least-squares means for each experimental condition and a complete ANOVA table are displayed. Special emphasis is given to statistically significant effects that are not related to the hypotheses and to appropriate follow-up tests.

Accuracy (Hypotheses 1 and 2)

Hypothesis 1 posits that auditors' memories are more accurate for information pertaining to areas of higher risk than for information pertaining to areas of lower risk. Hypothesis 2 posits that auditors' memories are more accurate for information that is of greater importance than for information that is of lesser importance. To test the first and second hypotheses, an incomplete block ANOVA was conducted with A_z (accuracy) as the dependent variable and (1) block and subject-within-block as between-subject effects and (2) risk, area, importance, the risk-by-importance interaction, the area-by-importance interaction, the block-by-importance interaction and the residual as within-subject effects.¹⁶ Hypothesis 1 would be supported by a significant main effect of risk where the mean A_z is greater for the higher-risk condition than the lower-risk condition. Similarly, H2 would be supported by a significant main effect of importance where the mean A_z is greater for more important items than for less important items.

Table 2 presents the least-squares mean A_z scores. The bottom left portion of table 2 demonstrates that the A_z least-squares mean of .8281 for the higher risk condition is greater

¹⁶ In this incomplete block design, block is perfectly confounded with the risk-by-area interaction.

TABLE 2
Least-Squares Means: A_z (Accuracy)

	Lower Risk				Higher Risk			
	Inventory		A/R		Inventory		A/R	
	L Imp	G Imp	L Imp	G Imp	L Imp	G Imp	L Imp	G Imp
Blk 1	.5814	.8374					.7664	.8960
Blk 2			.7413	.8276	.7248	.9252		

	L Risk	H Risk		Inventory	A/R	
L Imp	.6614	.7456	.7035	L Imp	.6531	.7539
G Imp	.8325	.9106	.8716	G Imp	.8813	.8618
	.7469	.8281			.7672	.8078

A/R = Accounts Receivable; L Imp = Lesser Importance; G Imp = Greater Importance; Blk = Block; L Risk = Lower Risk; and, H Risk = Higher Risk.

than the least-squares mean of .7469 for the lower risk condition. The difference in least-squares means is in the predicted direction and is statistically significant ($t = 3.6663$, $p = .0002$). Therefore, subjects' memories were significantly more accurate for information contained in higher risk areas, providing support for H1. The bottom left portion of table 2 also demonstrates that the A_z least-squares mean of .8716 for items of greater importance is greater than the least-squares mean of .7035 for items of lesser importance. The difference in least-squares means is in the predicted direction and is statistically significant ($t = 7.5951$, $p = .0001$). Therefore, subjects' memories were significantly more accurate for information that is of greater importance, providing support for hypothesis 2.^{17,18} Interestingly, the least-squares mean in the lower risk, lesser importance cell is .6614, significantly greater than .5000 ($t = 6.6184$, $p = .0001$). Therefore, subjects' memories were significantly more accurate than chance, even in the cell corresponding to the area of lower risk and information of lesser importance.

Table 3 indicates that a significant area by importance interaction ($F = 7.3831$, $p = .0081$) exists, indicating that the effect of importance was different across the two levels of area. Follow-up tests showed that the simple effect of importance was significant at each level of area (inventory: $t = 7.2918$, $p = .0001$; accounts receivable: $t = 3.4496$, $p = .0005$) demonstrating that support for H2 does not depend on area. Beyond this, no other effects were significant at $\alpha = .05$.¹⁹

¹⁷ The correlation between the rated importance of the greater importance items (from the pretesting) and the auditor's correctness on items (i.e., response is coded correct if an item previously encountered is marked as 1, 2 or 3 or if an item not previously encountered is marked as 4 or 5) is .1030 ($p = .0006$). Therefore, the importance of items positively affects accuracy even if the lesser importance items are ignored.

¹⁸ If percent of correct responses (correct response as defined in footnote 17) is employed as the dependent variable in the tests of H1 and H2, then the conclusions regarding accuracy are the same as when A_z is employed. However, the effect sizes (H1: $t = 3.2409$; H2: $t = 5.7671$) are smaller for percent of correct responses.

¹⁹ Attention could be considered an intervening construct between risk and accuracy. Review time is a possible surrogate for attention. Review time and A_z are positively correlated ($r = .3090$, $p = .0009$). If review time is included as a covariate in the A_z regression model, then review time is both significant and positive ($\beta = 0.1793$, $p = .0179$), risk is no longer significant ($F = 0.2371$, $p = .6277$), and the significance of other variables is unchanged. These results are consistent with review time being an intervening variable between risk and A_z .

TABLE 3
ANOVA on A_z (Accuracy)

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F^a</i>	<i>p > F</i>
Between Subjects					
Block or Risk*Area	0.0330	1	0.0330	1.3062	.2635
Subject(Block)	.6577	26	0.0253		
Within Subjects					
Risk	0.1835	1	0.1835	13.4421	.0004
Area	0.0460	1	0.0460	3.3704	.0702
Importance	0.7873	1	0.7873	57.6850	.0001
Risk*Importance	0.0002	1	0.0002	0.0188	.8913
Area*Importance	0.1008	1	0.1008	7.3831	.0081
Block*Importance	0.0170	1	0.0170	1.2485	.2673
Residual	1.0646	78	0.0136		

^aThe Subject(Block) mean square is the appropriate error term for the between-subjects effects. The Residual mean square is the appropriate error term for the within-subjects effects.

Willingness to Rely on Memory (Hypotheses 3 and 4)

Hypothesis 3 posits that an auditor will be less likely to rely on memory for information contained in areas of higher risk than in areas of lower risk. Hypothesis 4 posits that an auditor will be less likely to rely on memory for information that is of greater importance than for information that is of lesser importance. The third and fourth hypotheses were tested twice in two separate incomplete block ANOVAs. In the first ANOVA, C_a served as the dependent variable and (1) block and subject-within-block as between-subjects effects and (2) risk, area, importance, criterion level (C_a is estimated at four levels for each area for each subject), the risk-by-importance interaction, the risk-by-level interaction, the area-by-importance interaction, the area-by-level interaction, the importance-by-level interaction, the block-by-importance interaction, the block-by-level interaction, the risk-by-importance-by-level interaction, the area-by-importance-by-level interaction, the block-by-importance-by-level interaction and the residual as within-subjects effects.

Hypothesis 3 would be supported if the risk-by-level_{linear} interaction contrast indicates that the linear trend of level is steeper for the higher risk condition than the lower risk condition. This particular form of the risk-by-level_{linear} interaction would indicate less willingness to use extreme ratings on the response scale in the higher risk condition. Similarly, H4 would be supported by a significant importance-by-level_{linear} interaction contrast in which the linear trend of level is of larger magnitude for the greater importance condition than for the lesser importance condition.

Table 4 presents the least-squares mean C_a scores. The bottom center portion of table 4 demonstrates that the C_a least-squares mean is less for the higher risk condition than for the lower risk condition for level 3 (but not for level 4) and greater for the higher risk condition than for the lower risk condition for levels 2 and 1. The risk-by-level_{linear} contrast is in the predicted direction but is not statistically significant ($t = 0.7049$, $p = .2407$). Therefore, subjects were not less willing to rely on memory for information contained in areas of higher risk compared to areas of lower risk, not providing support for H3.

The bottom left portion of table 4 demonstrates that the C_a least-squares mean is less for the greater importance condition than for the lesser importance condition for levels 4 and 3, and greater for the greater importance condition than for the lesser importance condition for levels 2 and 1. Furthermore, the importance-by-level_{linear} contrast is in the predicted direction and is statistically significant ($t = 3.4294$, $p = .0004$). Therefore, subjects were less willing to rely on memory for information of greater importance, providing support for H4. Follow-up tests demonstrate that the linear trend of level is significant in the lesser ($t = 24.7348$, $p = .0001$) and greater ($t = 30.7969$, $p = .0001$) importance conditions. Beyond this, table 5 indicates that no other effects were significant at $\alpha = .05$ except for the expected main effect of level ($F = 517.6594$, $p = .0001$) and the area-by-importance interaction ($F = 20.8387$, $p = .0001$). The bottom right portion of table 4 demonstrates that the C_a least-squares mean is smaller for the greater importance condition than the lesser importance condition for inventory but not for accounts receivable. Furthermore, both of these differences are statistically significant (inventory: $F = 8.8931$, $p = .0031$; accounts receivable: $F = 12.0576$, $p = .0006$). Apparently, for inventory the auditors have more of a tendency (on average across levels) to say "yes" in the greater importance condition than in the lesser importance condition. In contrast, for accounts receivable the auditors have more of a tendency (on average across levels) to say "no" in the greater importance condition than in the lesser importance condition.

In the second ANOVA for investigating hypotheses 3 and 4, the Likelihood of Investigation score served as the dependent variable and (1) block and subject-within-block as

TABLE 4
Least-Squares Means: C_{α} (Decision Criterion) at Four Levels

Blk	Lvl	LOWER RISK				HIGHER RISK			
		Inventory		A/R		Inventory		A/R	
		L Imp	G Imp	L Imp	G Imp	L Imp	G Imp	L Imp	G Imp
1	4	-1.0061	-1.3384					-1.2382	-1.1695
	3	-.4567	-.6127					-.6311	-.5478
	2	.4419	.2868					.3370	.6641
	1	1.1486	1.1389					1.0870	1.5035
2	4			-1.3395	-1.1888	-.8824	-1.4694		
	3			-.6013	-.4845	-.3032	-.9572		
	2			.2556	.6460	.3621	.5638		
	1			1.1100	1.4009	1.2178	1.3097		

Lvl	L Imp	G Imp		Lvl	L Risk	H Risk		Inv	A/R
4	-1.1165	-1.2915	-1.2040	4	-1.2182	-1.1899	L Imp	.0653	-.1276
3	-.4981	-.6505	-.5743	3	-.5388	-.6098	G Imp	-.1348	.1030
2	.3491	.5402	.4447	2	.4076	.4817		-.0348	-.0123
1	1.1409	1.3383	1.2396	1	1.1996	1.2795			
	-.0311	-.0159			-.0375	-.0096			

A/R = Accounts Receivable; Blk = Block; Lvl = Level; L Imp = Lesser Importance; G Imp = Greater Importance; L Risk = Lower Risk; and, H Risk = Higher Risk.

between-subjects effects and (2) risk, area, importance, A_{α} ,²⁰ the risk-by-importance interaction, the area-by-importance interaction, the block-by-importance interaction, the A_{α} -by-importance interaction and the residual as within-subjects effects.²¹ Hypothesis 3 would be supported by a significant main effect of risk where the Likelihood of Investigation score is smaller for the high-risk condition than the low-risk condition.²² Similarly, H4 would be supported by a significant main effect of importance where the Likelihood of Investigation score is smaller for more important items than for less important items.

Table 6 presents the least-squares mean Likelihood of Investigation scores. The bottom left portion of table 6 demonstrates that the least-squares mean Likelihood of Investigation score is not smaller for the higher risk condition than for the lower risk condition ($2.874 > 2.873$). The difference in least-squares means is not statistically significant ($F = 0.0001$, $p = .9935$). Therefore, subjects' likelihood of referring back to the working papers was not related to the riskiness of the area, not providing support for H3. The bottom left portion

²⁰ A_{α} is included as an independent variable in order to examine the effect of the other independent variables on the Likelihood of Investigation score after controlling for accuracy. In addition, the inclusion of A_{α} permits the examination of the effect of accuracy on the Likelihood of Investigation score.

²¹ The interactions of A_{α} and the other independent variables (besides importance) are not included in the model because the addition of the other interactions did not significantly increase the explanatory power of the model ($F(6,70) = 0.5911$; $p = .7364$).

²² On the response scale for the second question, "1" represents "Definitely, or almost definitely, refer back to the working papers to verify the truth or falsity of this statement." Similarly, "5" represents "Definitely, or almost definitely, *not* refer back to the working papers to verify the truth or falsity of this statement." Therefore, a smaller Likelihood of Investigation score is indicative of less willingness to rely on memory.

TABLE 5
ANOVA on C_a (Decision Criterion)

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F^a</i>	<i>p > F</i>
Between Subjects					
Block or Risk*Area	0.0004	1	0.0004	0.0006	.9815
Subject(Block)	19.6380	26	0.7553		
Within Subjects					
Risk	0.0801	1	0.0801	0.3486	.5553
Area	0.0523	1	0.0523	0.2278	.6335
Importance	0.0239	1	0.0239	0.1042	.7470
Level	356.6897	3	118.8966	517.6594	.0001
Risk*Importance	0.0487	1	0.0487	0.2118	.6456
Risk*Level	0.3864	3	0.1288	0.5608	.6412
Area*Importance	4.7862	1	4.7862	20.8387	.0001
Area*Level	0.2685	3	0.0895	0.3897	.7605
Importance*Level	3.2993	3	1.0998	4.7883	.0028
Block*Importance	0.0234	1	0.0234	0.1019	.7498
Block*Level	0.0975	3	0.0325	0.1416	.9350
Risk*Importance*Level	0.8220	3	0.2740	1.1929	.3123
Area*Importance*Level	0.3046	3	0.1015	0.4420	.7231
Block*Importance*Level	0.6682	3	0.2227	0.9698	.4070
Residual	82.6852	360	0.2297		

^aThe appropriate error term for Block is a linear combination of the Subject(Block) mean square and the Residual mean square. The Residual mean square is the appropriate error term for the within-subjects effects.

of table 6 demonstrates that the least-squares mean Likelihood of Investigation score is smaller for information of greater importance than for information of lesser importance

TABLE 6
Least-Squares Means: Likelihood of Investigation Score

		<i>LOWER RISK</i>				<i>HIGHER RISK</i>			
		<i>Inventory</i>		<i>A/R</i>		<i>Inventory</i>		<i>A/R</i>	
		<i>L Imp</i>	<i>G Imp</i>	<i>L Imp</i>	<i>G Imp</i>	<i>L Imp</i>	<i>G Imp</i>	<i>L Imp</i>	<i>G Imp</i>
Blk 1		3.097	2.734					2.992	2.595
Blk 2				3.005	2.657	3.263	2.644		

	<i>L Risk</i>	<i>H Risk</i>	
<i>L Imp</i>	3.051	3.128	3.089
<i>G Imp</i>	2.695	2.620	2.657
	2.873	2.874	

A/R = Accounts Receivable; L Imp = Lesser Importance; G Imp = Greater Importance; Blk = Block; L Risk = Lower Risk; and, H Risk = Higher Risk.

TABLE 7
ANOVA on Likelihood of Investigation Score

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F^a</i>	<i>p > F</i>
Between Subjects					
Block or Risk*Area	0.0380	1	0.0380	0.0550	.8164
Subject(Block)	18.1242	26	0.6971		
Within Subjects					
Risk	0.0000	1	0.0000	0.0001	.9935
Area	0.3857	1	0.3857	3.0509	.0847
Importance	1.2013	1	1.2013	9.5021	.0029
A _z	2.6038	1	2.6038	20.5952	.0001
Risk*Importance	0.1419	1	0.1419	1.1221	.2928
Area*Importance	0.0892	1	0.0892	0.7052	.4037
Block*Importance	0.0724	1	0.0724	0.5724	.4516
A _z *Importance	0.7607	1	0.7607	6.0167	.0165
Residual	9.6086	76	0.1264		

^aThe appropriate error term for Block is a linear combination of the Subject(Block) mean square and the Residual mean square. The Residual mean square is the appropriate error term for the within-subjects effects.

(2.657 < 3.089). The difference in least-squares means is statistically significant ($t = 3.0825$, $p = .0015$). Therefore, subjects' likelihood of referring back to the working papers was higher for items of greater importance after controlling for other variables, providing support for H4. Notice that for both hypotheses 3 and 4, the conclusions regarding auditors' willingness to rely on memory are the same regardless of which surrogate, C_a or the Likelihood of Investigation score after controlling for the effect of A_z , is employed.²³

Table 7 indicates that the main effect of A_z is statistically significant ($F = 20.5952$, $p = .0001$). Furthermore, the regression coefficient on A_z is positive, indicating that subjects' likelihood of referring back to the working papers was negatively related to their accurate recognition of that information after controlling for other variables.²⁴ In addition, the correlation between A_z and the Likelihood of Investigation score is .2226 ($p = .0183$). The A_z -by-importance interaction is statistically significant ($F = 6.0167$, $p = .0165$), indicating that the effect of A_z was different across the two levels of importance. Follow-up tests showed that the simple effect of A_z was significant at each level of importance (lesser importance: $F = 6.5525$, $p = .0125$; greater importance: $F = 17.7679$, $p = .0001$). The correlation between A_z and the Likelihood of Investigation score is .2930 ($p = .0284$) for lesser importance and .4271 ($p = .0010$) for greater importance. Overall, these results indicate that as accuracy increases, the likelihood of referring back to the working papers decreases. Furthermore, this association is stronger for items of greater importance. Beyond this, no other effects were significant at $\alpha = .05$.

²³ However, for both H3 and H4, the effect sizes are larger for C_a than for the Likelihood of Investigation score after controlling for the effect of A_z .

²⁴ A positive regression coefficient is representative of a negative relationship because of the coding of the response scale mentioned in footnote 22.

V. DISCUSSION

The Statements on Auditing Standards specify that:

The work performed by each assistant should be reviewed to determine whether it was adequately performed and to evaluate whether the results are consistent with the conclusions to be presented in the auditor's report. (AICPA 1997, AU 311.13)

Although the review process is an integral part of auditing, few studies have addressed the issues of reviewer cognition and the effects of environmental and contextual features on reviewer behavior (Rich et al. 1997b).

The current research has focused particularly on auditors' memory for evidence gathered during working paper review. Two prominent features of the auditing environment, audit risk and information importance, were manipulated in an experiment designed to test their effects on both the accuracy of auditors' memory and auditors' willingness to rely on memory. The results suggest that the manipulations were successful in altering auditors' cognitive activities during the review process. Specifically, (1) auditors' memories were found to be more accurate for information contained in higher risk areas and for information which is of greater importance, and (2) auditors' willingness to rely on memory was found to be negatively related to the importance of the information. However, auditors' willingness to rely on memory was not found to be related to the level of audit risk. This may be the case because the desired level of audit risk has been achieved in all areas after the review of the working papers has been completed.

A number of general conclusions can be made regarding how some of the results relate to prior research. First, evidence consistent with auditors purposefully altering their review behavior in response to environmental factors (as suggested by Bamber 1983; Bamber and Bylinski 1987; Bamber et al. 1988; Asare and McDaniel 1996) was found. Specifically, direct evidence that auditors spent significantly more time reviewing areas in which audit risk is higher and indirect evidence that auditors devoted more attention to reviewing items of greater importance was found. Second, if the Likelihood of Investigation score is viewed as a surrogate for confidence, the current results related to calibration of auditors' confidence (i.e., the relationship between accuracy and confidence) can be compared to prior research. For example, Moeckel and Plumlee (1989) found the association between accuracy and confidence to be positive for "explicit" items, slightly negative for "new" items and negative for contradicted "inference" items. In addition, some psychological research indicates a positive association between accuracy and confidence (e.g., Glenberg and Epstein 1985, 1987; Bothwell et al. 1987) while other research indicates a negative association between accuracy and confidence (for a review, see Plous 1993). Furthermore, some previous research has demonstrated that longer and/or deeper processing of information increases the association between accuracy and confidence (e.g., Bothwell et al. 1987; Tetlock and Kim 1987) and some has not (e.g., Schneider and Laurion 1993). Our findings indicate that relatively experienced auditors performing working paper review are well calibrated. Specifically, in the current study the association between accuracy and confidence was found to be positive and stronger for items of greater importance than items of lesser importance. Interestingly, even for items of lesser importance, the correlation between accuracy and confidence was found to be significantly greater than zero.

While there are many differences between Moeckel and Plumlee (1989) and the current experiment (e.g., subjects, firms, response scales, dependent measures), there are two differences that may explain the inconsistent results related to calibration of auditors' confidence. First, the inclusion of stimulus importance in the design and analysis of the current

study increases the power to detect an accuracy-confidence association. Specifically, if importance and the interactions involving importance are excluded from the Likelihood of Investigation score ANOVA (table 7), the F-statistic associated with A_z (accuracy) decreases from 20.5952 to 2.4136. Second, eight (of the 24) stimuli employed in the Moeckel and Plumlee (1989) study are "contradicted inferences" (i.e., inferences that can be drawn from information present in the workpapers, but are contradicted in another part of the workpapers) and subjects had to respond "new" (i.e., "no") to these stimuli in order to be correct. Moeckel and Plumlee (1989) found the accuracy-confidence association to be most negative for these stimuli. The current study, however, does not employ stimuli comparable to the "contradicted inferences" items.

The results also have implications for understanding the effectiveness and efficiency of the review process and activities surrounding the review process. First, the effort allocation results suggest that the review process may contribute to the controlling of audit risk. Specifically, since the review process has been identified as a means of detecting and correcting client and preparer error (e.g., AICPA 1997, AU 311.13; Asare and McDaniel 1996; Libby and Trotman 1993; Rich et al. 1997b), allocating a greater percentage of the available time to areas of higher risk compared to areas of lower risk is likely to decrease the chances that material errors and omissions will go undetected. Second, as noted by Moeckel and Plumlee (1989), auditors often evaluate current evidence based on the memory of previous evidence. Therefore, the finding that auditors' memories are significantly more accurate for information contained in higher risk areas and for items of greater importance suggests that the review process contributes to audit effectiveness because current evidence is likely to be correctly evaluated in light of previous evidence on areas and items that are of most importance to the audit. Third, efficiency considerations dictate that auditors can not and should not re-examine working papers to verify all pieces of information (Libby and Trotman 1993). The finding that auditors refer back to the working papers less often as the importance of information decreases suggests that the manner in which auditors' memories work in the context of the review process promotes audit efficiency because auditors, in deciding whether to rely on memory, appear to consider the costs and benefits associated with verifying evidence. Furthermore, the findings regarding the association between accuracy and confidence suggest a facilitation of audit efficiency because auditors appear to have a better idea of when they need to refer back to the working papers (i.e., calibration of confidence increases) as the importance of information increases.

Finally, this research makes a methodological contribution by introducing signal detection theory (SDT) measures (and methods) to recognition memory research in accounting. This is also the first research to employ a SDT-based surrogate for willingness to rely on memory (or confidence). SDT can be considered a theory of recognition memory in which accuracy and decision criteria are independent constructs. The A_z (accuracy) and C_a (willingness to rely on memory) measures are derived directly from SDT so they possess a high degree of construct validity. That is, the use of SDT concepts, methods and measures improves the pre-experimental explication and differentiation of constructs and facilitates the choice of the best surrogates to represent constructs (Cook and Campbell 1979, 59–69). In addition, because SDT accuracy measures are likely to be statistically more efficient and less biased than non-SDT accuracy measures (e.g., Swets and Pickett 1982; Swets 1986), statistical conclusion validity and internal validity should, in theory, increase (see Cook and Campbell 1979, 80). In fact, our results regarding H1–H4 are closer to the hypothesized predictions (i.e., the effect sizes are larger) with SDT measures than with non-SDT measures.

APPENDIX

Example of A_s and C_s Calculation

This appendix contains a summary description of how A_s and C_s are calculated by means of the confidence-rating procedure from subjects' rating data on the first question of the recognition-referral task. To illustrate these calculations, the rating data for one subject from one cell (higher risk, lesser importance) of the experiment is used. Recall that the rating categories are: (1) definitely, or almost definitely, true; (2) probably true; (3) possibly true; (4) probably false; and (5) definitely, or almost definitely, false. The raw frequencies by rating category and state of nature for this subject are as follows:

	Rating Category					Total
	5	4	3	2	1	
Signal	1	1	2	3	3	10
Noise	2	3	1	3	1	10

The first step is to convert the raw frequencies in each rating category to proportions of the total signal and noise trials as follows:

	Rating Category					Total
	5	4	3	2	1	
Signal	.10	.10	.20	.30	.30	1.00
Noise	.20	.30	.10	.30	.10	1.00

Next, the proportions by category and signal and noise distribution are cumulated from right to left. This is done to obtain the "hit rate" and "false alarm rate" for each decision criterion the subject can adopt. Specifically, since subjects can respond in five categories, four criteria exist to delineate the rating categories (one between each category). Thus, the cumulated proportions represent the hit and false alarm rates that would occur if the subject were induced to set a yes-no criterion at each of the four criteria defined by the five rating categories (Gescheider 1985). For example, if the subject were to adopt the criterion between categories 4 and 3, all of the assumed yes responses in categories 3, 2 and 1 for signal trials would be hits. Similarly, all of the assumed yes responses in categories 3, 2 and 1 for noise trials would be false alarms. Cumulating from right to left yields the following hit and false alarm rates.

	Rating Category				
	5	4	3	2	1
Signal (hit rates)	1.00	.90	.80	.60	.30
Noise (false alarm rates)	1.00	.80	.50	.40	.10

Columns 1–4 of the previous table represent the hit rate (top row), false alarm rate (bottom row) pairs at four different decision criteria (with column 1 representing the subject's most strict criterion and column 4 representing the subject's most lenient criterion). Sample points 1 through 4 serve as the basis for generating the ROC curve. A maximum-likelihood estimation, curve-fitting procedure (Dorfman et al. 1994) is employed to generate

estimates of SDT parameters assuming an underlying bivariate normal model. These estimates include A_z (the area under the best-fitting ROC curve), B (the ratio of the standard deviation of the noise distribution to the standard deviation of the signal distribution) and the estimated points at each of the four decision criteria on the best-fitting ROC curve. For this particular subject, A_z equals .6744 and B equals 0.9012. The sample points (represented by open circles) and the ROC curve generated are graphed in figure 2.

The estimated points for the subject at each decision criterion are:

	Criterion			
	4	3	2	1
Hit Rate (H)	.9099	.7576	.6237	.2982
False Alarm Rate (F)	.7916	.5398	.3724	.1033

C_a , the measure of decision criterion, is the distance of each estimated point from the zero-bias point (the ROC curve minor diagonal) in units of the root-mean-square standard deviation (a kind of average of the standard deviations of the noise and signal distributions). C_a is calculated at each estimated point by means of the following formula:

$$C_a = \frac{\sqrt{2}B}{(1 + B^2)^{.5}(1 + B)} [Z(H_a) + Z(F_a)]$$

where:

B = the ratio of the standard deviation of the noise distribution to the standard deviation of the signal distribution,

$Z(\bullet)$ = the Z-score transform of the given probability,

H_a = the hit rate, and

F_a = the false alarm rate.

Notice that the above formula reduces to $C_a = -.5[Z(H_a) + Z(F_a)]$ if the standard deviations of the noise and signal distributions are equal (i.e., $B = 1$).

The value of C_a at each estimated point for this subject is:

C_a	Criterion			
	4	3	2	1
	-1.0717	-0.3977	0.0051	0.8927

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Fraud Type and Auditor Litigation: An Analysis of SEC Accounting and Auditing Enforcement Releases

Sarah E. Bonner
Zoe-Vonna Palmrose
Susan M. Young
University of Southern California

ABSTRACT: This study examines whether certain types of financial reporting fraud result in a higher likelihood of litigation against independent auditors. We expect that auditors are more likely to be judged responsible for failing to detect commonly occurring frauds or those that stem from fictitious transactions. We examine companies with SEC Accounting and Auditing Enforcement Releases and designate whether each fraud present in their financial statements is common and/or arises from fictitious transactions. We then examine whether these types of fraud are related to auditor litigation in analyses that control for various client, auditor and case characteristics. Our results provide some support for our two primary hypotheses—auditors are more likely to be sued when the financial statement frauds are of a common variety or when the frauds arise from fictitious transactions.

Key Words: *Auditor litigation, Fraud, SEC enforcement actions, Auditor responsibility.*

Data Availability: *The data used in this study are available from public sources.*

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I. INTRODUCTION

This study examines whether financial statement frauds that commonly occur within the population of fraud schemes and those that involve fictitious transactions and events result in a higher incidence of litigation against independent auditors. We expect that juries and judges are more likely to hold auditors responsible for failing to detect frauds of these types. Further, we expect that attorneys filing lawsuits against auditors would anticipate such behavior. To address these issues, we document the frauds present in the financial statements of companies that were the subject of Accounting and Auditing Enforcement Releases (AAERs) by the Securities and Exchange Commission (SEC) from 1982 to 1995, designate each fraud as commonly occurring and/or as arising from fictitious transactions,¹ and examine the association of these fraud types with litigation against auditors in multivariate analyses.

This study makes several contributions. It is the first to examine whether the type of fraud matters in the occurrence of litigation against auditors. Previous research indicates simply that the existence of any type of fraud is a significant factor in auditor litigation (e.g., Carcello and Palmrose 1994; Palmrose 1987; St. Pierre and Anderson 1984). Detecting and disclosing fraud is a significant element in the supply of audit services and litigation is a possible consequence for auditors who fail to fulfill their responsibilities in this regard. Consequently, it is important to understand more about whether different types of fraud differentially affect the likelihood of litigation. Further, as illustrated by the issuance of Statement on Auditing Standards (SAS) No. 82, *Consideration of Fraud in a Financial Statement Audit* (AICPA 1997), and the provisions related to fraud contained in The Private Securities Litigation Reform Act of 1995 (the 1995 Reform Act), fraud continues to be an important topic to auditors and regulators.

By examining litigation in the context of SEC enforcement actions,² this study also provides evidence on the intersection of regulatory enforcement and private civil litigation against auditors and others.³ We compare three groups of companies with SEC enforcement actions—those with auditor litigation, those with financial reporting and disclosure litigation not involving auditors (other litigation) and those with no reporting and disclosure litigation. While the primary focus of this study is on the role of the type of fraud, we also discuss client, auditor and other case characteristics that distinguish among companies with auditor, other and no litigation.

We find some support for the hypothesized higher incidence of auditor litigation when a company's financial statements contain a fraud that is commonly occurring or that involves fictitious transactions and events. These factors are hypothesized to affect juries' and

¹ We use the terms "fictitious transaction frauds" and "fictitious transaction and event frauds" interchangeably.

² Research involving SEC enforcement actions includes: Beneish's (1997) comparison of GAAP violators (primarily companies with SEC enforcement actions) to aggressive accruals to identify differences between detected and undetected earnings managers; Dechow et al.'s (1995) evaluation of the performance of alternative models at detecting earnings management; Dechow et al.'s (1996) examination of the causes and consequences of earnings manipulation; and Feroz et al.'s (1991) examination of the financial and market effects of SEC enforcement actions.

³ Because of the SEC's limited resources, the public policy debate over legal reform often gives private civil litigation a central role (1) in deterring material omissions and misstatements in financial reporting and disclosures and (2) in compensating users for losses therefrom. Nonetheless, the SEC's enforcement activities may facilitate private civil litigation, even though enforcement actions can conclude in AAERs long after the filing (resolution) of private lawsuits. Previous research reports significantly higher likelihoods of auditor litigation (Carcello and Palmrose 1994) and of securities class action litigation (Jones and Weingram 1996b) for companies that are the subject of SEC enforcement actions. Also, auditor litigation rates in this setting are more than twice those found in other settings (e.g., Carcello and Palmrose 1994). These findings are consistent with the importance of fraud in litigation against auditors and others, and/or SEC enforcement actions facilitating private civil litigation.

judges' beliefs about auditors' responsibility for detecting fraud through specific reasoning processes. Our results suggest that the occurrence of litigation against auditors may reflect anticipation of judges' and juries' reasoning processes by plaintiff attorneys.

While we focus on two types of fraud based on behavioral concepts, we recognize the potential relevance of accounting and auditing concepts for determining an auditor's responsibility for fraud. However, additional analyses rule out various accounting and auditing explanations for the results. For example, the results cannot be primarily explained by whether the fraud involves (1) important accounts (i.e., revenues, receivables and inventory), (2) revenues, (3) assets, (4) overstatements (rather than understatements) of assets and/or income, (5) disclosures, or (6) related parties.

Overall, these results are of interest to audit firms in that they establish that certain types of fraud result in a higher incidence of litigation against auditors. The insights this study provides on auditor litigation and fraud may prove useful to audit firms in revising practices to improve the detection of fraudulent financial reporting.

The remaining sections of the paper are organized as follows. Section II provides the rationale for using SEC enforcement actions. Section III outlines the hypotheses regarding the effects of common and fictitious transaction frauds on auditor litigation; section IV explains the taxonomy we developed to document types of fraud. Section V describes the variables in the multivariate model for examining the role of types of fraud in auditor litigation. Section VI describes the sample selection process and sample. Section VII presents the tests of hypotheses and analyses to rule out alternative explanations. Section VIII provides a summary and concluding remarks.

II. SEC ENFORCEMENT ACTIONS

We use the issuance of an AAER as a proxy for fraud. This is consistent with extant research on auditor litigation (Carcello and Palmrose 1994) and securities class action litigation (Jones and Weingram 1996b). This proxy is intended to capture circumstances at the fraud end of an errors-to-fraud continuum. We recognize, however, that AAERs differ as to their severity and control for this in our analyses.

A focus on SEC enforcement actions has both advantages and limitations. One significant advantage is that SEC enforcement actions are an objective criterion for identifying companies with fraudulent financial reporting. Feasible, objective criteria for identifying companies with fraudulent financial reporting but no litigation are especially limited. Furthermore, SEC enforcement actions appear to capture the majority of fraudulent financial reporting for companies with auditor litigation. For example, based on Carcello and Palmrose (1994), over 80 percent of bankrupt public companies with fraud and auditor litigation have SEC enforcement actions.⁴ Finally, the SEC often describes in an AAER the nature of the fraud. These descriptions are not extensively available through other sources and are necessary for identifying and classifying fraud schemes.

We considered the possibility of selection bias as a potential limitation of using SEC enforcement actions. Enforcement actions may reflect specific SEC agendas; if so, enforcement actions may not produce a representative sample of frauds. We reviewed a number of articles on the SEC's enforcement activities for evidence of agendas. For example, Pincus et al. (1988) and Feroz et al. (1991) discuss the sources of leads and the SEC's process for pursuing them whereby a subset result in enforcement actions. We found some examples

⁴ In Carcello and Palmrose (1994), companies with auditor litigation and fraud (but not SEC enforcement actions) had criminal convictions of management for fraudulent financial reporting, internal investigations that confirmed fraudulent financial reporting, and/or enforcement actions by regulators other than the SEC.

of specific accounting and auditing concerns of the SEC such as client opinion shopping and auditor peer review. However, there were no indications of any SEC agenda that is correlated with the specific types of fraud in which we are interested. Also, as we note later, we compare the frequencies of frauds in our sample to those in a sample not based on enforcement actions (Loebbecke et al. 1989); for the most part, frequencies are quite similar.

III. HYPOTHESES DEVELOPMENT

Our overall hypothesis is that the presence of certain types of fraud increases the likelihood of litigation against auditors, given the presence of fraudulent financial reporting. This hypothesis is based on the idea that characteristics of fraud affect the strength of the case. Certain types of fraud possess characteristics that make it easier for a plaintiff's attorney⁵ to argue that the auditor should be held responsible for detecting the fraud and, correspondingly, more difficult for the auditor's attorney to defend that they should not.⁶ In effect, plaintiff attorneys anticipate how judges and juries reason about auditor responsibility for detecting fraud. Standard texts on trial techniques specifically discuss the reasoning processes of judges and juries and urge lawyers to consider them in developing their cases (e.g., Mauet 1996; Tanford 1993).⁷ We hypothesize that certain characteristics matter in these processes and that whether the types of fraud present in financial statements possess these characteristics is considered by plaintiff attorneys in their decisions to initiate litigation. Litigation against the auditor will be more likely the greater the plaintiff attorney's belief that the judge or jury will hold the auditor responsible for detecting the fraud.

We focus on two types of fraud—commonly (frequently) occurring frauds and fictitious transaction frauds—and expect that these types will result in a higher likelihood of auditor litigation. Frauds that possess these characteristics make a plaintiff attorney's case easier to argue because they are similar to factors considered by individuals when attributing responsibility for a negative event.⁸ A large body of research shows that judges and juries reason very similarly to the "common man" making everyday decisions.⁹ In particular,

⁵ The vast majority of our litigation observations involve class actions. In securities class actions, entrepreneurial attorneys decide whether to sue and the parties to include as defendants (Coffee 1986).

⁶ The general premise that a plaintiff's attorney would consider specific characteristics of a case is consistent with legal-economic models of the decision to sue based on estimates of the expected value of a case (e.g., Alexander 1991; Jones and Weingram 1996a; Palmrose 1991b; Priest and Klein 1984). For example, Priest and Klein (1984) describe the decision to litigate or settle in terms of the plaintiff's minimum settlement demand and the defendant's maximum settlement offer; the demand and offer are based on the plaintiff's and defendant's respective estimates of the probability of a plaintiff verdict, the expected stakes should a verdict be rendered for the plaintiff, and the estimated costs of litigating and settlement. Because the expected value is a function of both the expected amount of losses that will be recovered and the strength of the case (i.e., the probability of recovery), attorneys consider specific characteristics related to auditor responsibility that affect the strength of the case against auditor defendants (Kinney 1993).

⁷ A few large firms act as plaintiff counsel and these firms are expected to have knowledge about the reasoning processes of judges and juries in such cases.

⁸ We focus on these two characteristics because of their apparent link to hypothesized reasoning processes of judges and juries. Other characteristics of fraud seem not to have this link. For example, accounting and auditing dimensions of fraud clearly may be important in determining an auditor's responsibility for detecting a fraud, although they do not appear to relate to these reasoning processes, *per se*. Therefore, we focus on frequent and fictitious transaction frauds and use additional analyses to rule out some accounting and auditing dimensions as explanations for our results.

⁹ For example, see Boyll (1991), Feigenson (1995), Gold (1986), Jackson (1986), Landsman and Rakos (1994), Moore (1989), Pennington and Hastie (1990), Reyes et al. (1980) and Saks and Kidd (1980–1981). Although some believe that judges possess special expertise, several articles have shown that judges and juries reason in similar ways (e.g., Jackson 1986; Landsman and Rakos 1994).

when making judgments about a person's responsibility for a negative event (here, the failure to detect fraud), judges' and juries' behavior (and that of other individuals) is consistent with the predictions of attribution theory (Arrington et al. 1985; Boyll 1991; Feigenson 1995; Jennings et al. 1993; Karlovac and Darley 1988). Attribution theory indicates that people assess the extent to which the person rather than external circumstances is responsible for some event by considering how comparable persons would have acted under the circumstances (Kelley 1967, 1972, 1973; Nisbett et al. 1982; Ross and Anderson 1982; Weiner 1974). As described below, it is hypothesized that judges and juries would expect the average auditor to be more likely to detect frequently occurring and fictitious transaction frauds than other types of fraud. An auditor who does not detect such frauds, then, would be more likely to be considered acting unusually and more likely to be held responsible for the failure to detect the fraud.

Fraud can be perpetrated in a variety of ways, with some fraud schemes occurring more frequently than others. For example, revenue frauds are more common than accounts payable frauds (Loebbecke et al. 1989). We expect that auditors would be held more responsible for failing to detect the more common frauds based on the simple notion that auditors ought to know more about and be better at detecting events that occur more frequently. Research indicates that people believe that the more frequently something occurs, the more others ought to know about it (e.g., Stein 1997). Articles about the auditor's responsibility for detecting fraud have advocated the same idea (e.g., Berton 1992).¹⁰ In summary, we predict that judges and juries would believe that the average auditor would be more likely to detect a frequently occurring fraud than a less common fraud. This translates into their attributing a higher degree of responsibility for failure to detect more frequent frauds. Assuming plaintiff attorneys anticipate this reasoning, we propose the following hypothesis:

- H1:** There is a higher incidence of litigation against auditors when the frauds committed by a company include one that occurs frequently than when the frauds committed do not include one that occurs frequently.

Frauds also vary as to whether they involve either the direct falsification of transactions and events or the intentional early (delayed) recording of transactions that eventually occur. We expect that auditors would be held more responsible for failing to detect fictitious transaction frauds because they may be viewed by judges and juries as more egregious methods of committing fraud. For example, intentionally overstating sales by creating phony invoices may be considered to be a more egregious fraud than intentionally overstating sales using otherwise legitimate shipments after the end of the period. The business press gives disproportionate attention to fictitious transaction frauds and this attention reinforces perceptions of fictitious transaction frauds as more egregious.¹¹ This disproportionate attention also may make people believe these frauds occur more frequently than they actually

¹⁰ We assume that, on average, plaintiffs' attorneys are informed about the relative frequencies of types of fraud. This assumption seems reasonable given that a small number of sophisticated law firms handle the majority of securities class actions. For example, one study reports that nine law firms were involved as plaintiff counsel in 70 percent of securities class actions (O'Brien and Hodges 1993). Over 80 percent of the auditor litigation observations for which we were able to identify the plaintiff attorneys included these firms.

¹¹ Based on our reading of disclosures for selected cases of auditor litigation (Palmrose 1991a), we found that frauds involving fictitious transactions and events are mentioned far more frequently than those not involving fictitious items, and disproportionately more than their actual frequency of occurrence.

do; if so, fictitious transaction frauds could be viewed as frequently occurring frauds even if they are not.¹²

Fictitious transaction schemes also are unambiguously fraudulent. Frauds not involving fictitious transactions frequently represent premature recognition of transactions and events that eventually occur, so they may be perceived as involving smaller departures from generally accepted accounting principles (GAAP); they may even be perceived (incorrectly) as falling within the realm of judgment allowed by GAAP (Kiernan 1997). In this case, it may be more difficult for auditors who fail to detect fictitious transaction frauds to argue convincingly that their audits complied with generally accepted auditing standards (GAAS) (and, thus, had a high probability of detecting material violations of GAAP). For all these reasons, it is expected that judges and juries would believe the average auditor more likely to detect a fictitious transaction fraud than one not involving fictitious transactions. Again, assuming plaintiff attorneys anticipate this sort of reasoning, we propose the following hypothesis:

- H2:** There is a higher incidence of litigation against auditors when the frauds committed by a company include one that involves fictitious transactions than when the frauds committed do not include one that involves fictitious transactions.

IV. FRAUD TAXONOMY

To identify the fraud schemes present in companies' financial statements and to classify these frauds according to their type, we developed a fraud taxonomy. We developed the taxonomy, in part, to overcome some limitations of extant taxonomies, in particular, their incompleteness. In addition, we wanted a taxonomy that would better link with audit practice and facilitate designing substantive tests to improve the detection of fraud.¹³

We developed the taxonomy in several steps. First, we read most of the existing research and practitioner literature including books, articles and training materials on fraud. Sources that present fraud taxonomies include academic articles, practitioner articles and talks, a resource book for attorneys and the training materials of both one Big 6 firm and the National Association of Certified Fraud Examiners (NACFE) (Beneish 1997; Coglitore and Berryman 1988; Diacont 1994; Elliott and Willingham 1980; Kellogg and Kellogg 1991; Loebbecke et al. 1989; NACFE 1992; Schilit 1993).¹⁴ From these sources, several iterations of taxonomies were created; at each stage of development, we tested the taxonomy in some way.¹⁵ The final taxonomy includes the categories most common to all the other taxonomies (e.g., premature revenue recognition), along with those mentioned frequently by practitioners (e.g., related party transactions). Within each category, we listed all the fraud types (schemes) included in the sources we reviewed. Finally, we created a few additional types

¹² This phenomenon is known as the "availability bias" (e.g., Tversky and Kahneman 1973). Highly salient media coverage of events leads people to overestimate the frequencies of those events vis-à-vis events that are not covered as much (Lichtenstein et al. 1978).

¹³ Our taxonomy identifies schemes for perpetrating fraud and, in categorizing these schemes, considers how auditors conduct substantive testing. For example, auditors simultaneously test interrelated financial statement elements for overstatement and understatement. Further, auditors conduct different types of tests to detect different types of misstatements (e.g., fictitious inventory vs. pricing errors in inventory). We recognize these factors by grouping together fraud schemes both by type of manipulation (e.g., fictitious transactions or premature recognition of transactions) and by interrelated accounts (e.g., frauds that overvalue assets and undervalue expenses), rather than, for example, grouping together all schemes that affect an individual account.

¹⁴ The Big 6 firm is not named; its materials are proprietary.

¹⁵ Tests included interviews with practicing auditors, card-sorting tasks with practicing auditors, and reading a few AAERs to determine the applicability of the taxonomy.

within some categories to reflect fraud schemes found in AAERs several times, but not originally included in the list.

The taxonomy has 12 general categories of fraud. These are as follows: (A) fictitious revenues, (B) premature revenue recognition, (C) misclassifications, (D) fictitious assets and/or reductions of expenses/liabilities, (E) overvalued assets and undervalued expenses/liabilities, (F) omitted or undervalued liabilities (affecting expenses or assets), (G) omitted or improper disclosures, (H) equity frauds, (I) related party transactions, (J) frauds going the “wrong way” (those understating income and/or assets), (K) illegal acts and (L) miscellaneous (including consolidation issues). Each category contains multiple individual fraud schemes.¹⁶ Subsequent discussions of the test variables are based on this taxonomy.

V. MULTIVARIATE FRAMEWORK AND MEASUREMENT OF VARIABLES

Introduction

We use a multivariate model to examine whether frequent frauds or those involving fictitious transactions lead to increased litigation against auditors:

$$\text{auditor litigation} = f(\text{test variables for frequent and fictitious transaction frauds}; \\ \text{control variables for client, auditor and case characteristics}).$$

The model takes two forms. The first form has (1) auditor litigation or (0) no litigation as the dependent variable. The second form has (1) auditor litigation or (0) other litigation as the dependent variable. The model takes two forms to recognize that different variables may be significant in explaining suits against auditors depending on whether the comparison group contains firms with no litigation or whether the comparison group contains firms involved in litigation, but the litigation is not against auditors.¹⁷ For example, some no litigation companies may have expected recoverable user losses of insufficient magnitude to make litigation worthwhile, especially for class action attorneys working on a contingent-fee basis. We would expect control variables that proxy for this effect, e.g., client size, would be significant in analyzing auditor vs. no litigation, but not necessarily in auditor vs. other litigation.¹⁸

The independent variables consist of the test variables and control variables. The test variables for frequent frauds and fictitious transaction frauds are described in the next section. The following section discusses the control variables.

Test Variables

Each test variable is an indicator variable for the presence (1) or absence (0) of the type of fraud. We obtained these data by using our taxonomy to code the frauds discussed by the SEC for each company named in an AAER.

For testing H1, we use two different measures of the most frequent types of fraud. The first measures frequent frauds at the category level and is based on the frauds encountered by 121 KPMG Peat Marwick audit partners (Loebbecke et al. 1989). This measure has the advantage of being determined outside of our sample. We reconciled our taxonomy to the

¹⁶ Due to space limitations, we have not included the complete taxonomy that lists all schemes within each category. It is available on request.

¹⁷ Other litigation defendants include the company, officers, directors and underwriters. The vast majority of lawsuits against auditors likewise have these types of parties as additional defendants.

¹⁸ However, we expect that the sign of the coefficient for significant variables would be the same regardless of the form of the model.

Loebbecke et al. (1989) classifications of financial reporting fraud both by type of deceptive action and account (as reported in their tables 4 and 6). Based on this reconciliation, we identified three categories in our taxonomy as the most frequent types of fraud. These were (A) fictitious revenues, (B) premature revenue recognition and (E) overvalued assets and undervalued expenses/liabilities.¹⁹

Because individual fraud schemes within categories differ greatly as to their frequencies, we also measure the more frequent frauds at the individual scheme level. Loebbecke et al. (1989) do not provide enough information to determine the most frequent individual schemes. Thus, the second measure of frequent frauds is based on the most frequent schemes from within our sample of AAERs, even though our sample may not be entirely representative of the population of frauds. The most frequent schemes using our fraud taxonomy turned out to be (A1) fictitious sales not based on firm orders to buy, (E1) undervalued allowance for bad debts or loan losses, (G10) omitted or improper disclosures regarding accounting policies and (I4) related party disclosure problems.²⁰

For testing H2, determining which types of fraud involve fictitious transactions or events is straightforward based on our taxonomy. Fictitious transaction frauds are (A) fictitious revenues, (D) fictitious assets and/or reductions of expenses/liabilities and (I1) fictitious related party sales. As noted, in each instance (H1 and H2), the test variable is an indicator variable denoting the presence (absence) of any of the specified fraud categories or schemes. Finally, because the variables for frequent and fictitious transaction frauds both include either category A (frequent frauds, measure 1) or scheme A1 (frequent frauds, measure 2), the model also includes a variable to indicate the presence (absence) of the category (scheme) that is common to both test variables.

Control Variables

The control variables relate to client characteristics (client size, public status, exchange, client bankruptcy, client industry and initial public offering [IPO]), auditor characteristic (type of audit firm) and case characteristics (the number of years of fraud, the type of SEC settlement, the existence of an SEC enforcement action against the auditor and SEC actions that focus only on interim [unaudited] financial information).²¹ The remainder of this section explains these variables. Data on additional client (stock price returns), auditor (audit deficiencies) and case (amount of fraud) characteristics that may be associated with litigation against auditors are available for much-reduced numbers of observations in our sample; these variables are discussed in section VII.

¹⁹ Clearly, the mapping of fraud schemes from our taxonomy to Loebbecke et al. (1989) involved some subjectivity. Therefore, we also used three alternative codings for more frequent frauds: (1) A, B, D and E; (2) A, B, D, E and F; and (3) A, B, E and F. These alternative codings produced similar results. Further, anecdotal evidence supports designating categories A, B and E as higher frequency frauds (Steinberg and Walker 1997).

²⁰ This choice likewise involved some subjectivity. Again, we employed two additional codings for higher frequency schemes: (1) the two highest frequency schemes—A1 and E1, and (2) the seven highest frequency schemes (A1, E1, E2 [overvalued inventory], G8 [operating data disclosure problems], G10, I2 [premature or overvalued non-arm's-length transactions], and I4). Results were essentially unchanged.

²¹ We attempted to measure several other control variables, such as whether management lied to the auditor, whether collusion was involved, the specific office of the auditing firm primarily responsible for the client, and the importance of the client to the audit firm. There simply was not enough information on any of these variables to have meaningful measures. Also, we deleted a variable for criminal actions against auditors because it rarely occurred.

Client Characteristics

Client size is consistently associated with financial reporting and disclosure litigation when comparing companies with and without litigation against auditors (Carcello and Palmrose 1994; Lys and Watts 1994; Schultz and Gustavson 1978; Stice 1991) and when comparing companies with and without litigation against others (Francis et al. 1994a, 1994b; Jones and Weingram 1996a, 1996b, 1996c). This association may occur because larger companies are more likely to have resources, including adequate officers' and directors' insurance, available to pay plaintiffs and their attorneys (Dunbar et al. 1995). Firm size and litigation also may be linked through estimated damages. For example, Simmons (1997) reports correlations of over 50 percent between client size (ln total assets) and estimated damages. Finally, client size may affect the exposure to litigation because larger clients have more disclosures (Francis et al. 1994b). The model includes (ln) total assets to control for client size; it is measured as total assets at the end of the last year allegedly misstated.²² We expect client size to be positively related to auditor litigation and to be significant in distinguishing between companies with auditor and no litigation. However, consistent with Carcello and Palmrose (1994), for companies with litigation, client size may not be significant in distinguishing between those with and without auditors as defendants.

SEC enforcement actions can involve either public or non-public companies. Examples of the latter are some broker-dealers. St. Pierre and Anderson (1984) document a higher auditor litigation rate for public companies, so the model includes an indicator variable for public status (1 = yes, 0 = no). The model also includes a variable to indicate companies listed on the New York Stock Exchange (NYSE) (1 = yes, 0 = no), although Carcello and Palmrose (1994) find a similar variable not significant. Nonetheless, Simonetti and Andrews (1994) report 1 of every 8 companies on the NYSE, 1 of every 18 companies on the American Stock Exchange and 1 of every 20 companies on the NASDAQ have recent involvement in securities litigation. The exchange variable may also reflect client size.

Client bankruptcy is a common characteristic of lawsuits against auditors (Carcello and Palmrose 1994; Lys and Watts 1994; Palmrose 1987; St. Pierre and Anderson 1984). The model includes a variable to indicate clients declaring bankruptcy within three years of the last year of the allegedly misstated financial statements (1 = yes, 0 = no).

Client industry is a factor in the occurrence of litigation (e.g., see Francis et al. 1994b; Jones and Weingram 1996c; Martin et al. 1996). In both auditor litigation (Palmrose 1988) and securities class actions (under Section 10(b) and Rule 10b-5 of the Securities Exchange Act of 1934), technology and financial services companies appear to have higher litigation rates. The model includes two indicator variables to control for clients in these two industries (1 = yes, 0 = no). The technology indicator variable is set to 1 for firms with SIC codes in the 357s and 737s (computers) and the financial services indicator variable is set to 1 for firms with codes in the 600–639s and 670s.

The professional literature focuses on IPOs as high litigation risk engagements (e.g., AICPA 1995; Arthur Andersen et al. 1992). However, empirical evidence suggests litigation rates may not be higher on IPOs; also, the evidence documents a decline in auditor litigation rates on IPOs during the 1990s (Bunsis and Drake 1995). In spite of these ambiguities, the

²² If the last year was unavailable, we used the nearest year for which information was available. Because this study does not focus on predicting litigation against auditors, independent variables are not measured at dates prior to auditors' client acceptance/retention decisions.

model includes an indicator variable for companies with IPOs within three years of the first year of the fraud (1 = yes, 0 = no).²³

Auditor Characteristic

The model includes a variable for type of auditor (1 = Big 6, 0 = non-Big 6).²⁴ While the type of auditor may influence the likelihood of litigation, predictions are ambiguous. One argument is that, because Big 6 firms have greater resources, they are more likely to be litigation targets than other audit firms. On the other hand, Palmrose (1988) reports a higher litigation rate for non-Big 8 firms. This result suggests that litigation rates reflect quality differences among auditors and that Big 6 firms are of higher quality.²⁵ Because her study includes only the largest non-Big 8 firms, her sample is relatively homogeneous as to resources. Stice (1991) likewise has an indicator variable for type of auditor (Big 8 vs. non-Big 8); his variable is not significant.

Case Characteristics

Finally, the model includes four control variables to recognize case-specific circumstances. The first control variable measures the number of years with allegedly misstated financial information (partial years are counted to the nearest quarter—e.g., 1/4). We expect auditors to be more responsible for misstatements the longer they occur.

The second case-specific control variable captures the fact that SEC enforcement actions differ in their severity (Dechow et al. 1996; Feroz et al. 1991). Each observation is assigned a value for severity between 1 and 4 as follows: (1) accounting disputes identified as Exchange Act Releases and administrative proceedings, (2) actions for more than negligent violations of reporting and record keeping provisions (i.e., gross negligence or recklessness without scienter), (3) actions for injunctive relief under fraud provisions of the 1934 Act (i.e., with scienter) and (4) actions *only* against auditors (neither the company nor individuals—directors, officers, employees, related parties—are the subject of enforcement actions). These values are ranked from least severe to most severe from the auditor's perspective. Companies involved in multiple enforcement actions are coded according to the most severe one received. We expect that auditor litigation likelihood increases with severity.

The third case-specific control variable is an indicator variable to identify companies where the audit work resulted in enforcement actions against the companies' auditors (1 = yes, 0 = no). These observations should be more likely to have auditor litigation. This variable recognizes that many companies with enforcement actions for financial reporting (and, thus, with a 1, 2 or 3 for the severity variable) likewise have SEC actions against their auditor. (Note that observations with a 4 for the severity variable [SEC actions only against the auditor] automatically have a 1 for this variable.)

Finally, the fourth case-specific control variable indicates companies that have only interim (unaudited) financial statements subject to enforcement actions. We expect these

²³ We do not include a variable for seasoned equity offerings. Jones and Weingram (1996b) found that companies with seasoned equity offerings in the year before a major stock price fall are no more likely to be sued. We do not include an insider trading variable. Jones and Weingram (1996b) report that insider trading appears to have no effect on litigation risk. Dechow et al. (1996) likewise report insider trading did not significantly differ between their SEC enforcement and control companies. We do note, however, that Summers and Sweeney (1998) find an association between insider selling activity and the existence of fraudulently misstated financial statements.

²⁴ We use the Big 6 (non-Big 6) designation to likewise refer to the Big 8 (non-Big 8). We originally coded second-tier firms separately. However, there was such a small number (a total of 23) that meaningful analysis was not possible.

²⁵ However, Palmrose (1988) discusses the limitations of auditor litigation rates as quality surrogates.

companies to be less likely to have auditor litigation. (Note that the variable is coded 1 = yes [audited] and 0 = no [only unaudited statements].)

In summary, the multivariate analyses use a logistic regression model with the occurrence of auditor litigation (either 1 = yes, 0 = no litigation; or 1 = yes, 0 = other litigation) as the dependent variable and with independent variables consisting of a test variable for frequent frauds (two different measures) and for fictitious transaction frauds, a variable to control for frauds common to the frequent and fictitious transaction fraud measures and control variables for client, auditor and case characteristics. As previously discussed, due to data limitations, we separately analyze reduced samples with additional control variables for stock price returns, audit deficiencies and fraud size.

VI. SAMPLE SELECTION AND DESCRIPTION

Sample Selection

The sample is selected from the set of 390 companies that were the subject of SEC AAER Numbers 2 through 675.²⁶ The SEC filed these enforcement actions between 1982 and 1995. From the total set of 390 companies with enforcement actions, we deleted 129 companies for the following reasons: 24 companies with audit problems, but no alleged financial reporting problems (for example, some enforcement actions allege that auditors lack independence); 6 companies with forged audit opinions (these companies have no real auditor); 17 companies with actions involving some issue other than financial misstatements, e.g., misleading press releases; 27 companies with no information about fraud types in either the AAERs or other publicly available sources; 10 companies with no information about the misstated financial statement dates (for these companies, we are unable to measure various control variables); and 45 companies for which no financial statement information, in particular information on total assets, could be located.

Sample Description

The analyses use the remaining sample of 261 companies with SEC enforcement actions. Of these companies, 110 (42 percent) have no litigation, 98 (38 percent) have auditor litigation,²⁷ and 53 (20 percent) have other litigation.²⁸ Tables 1 and 2 provide descriptive statistics about the sample firms by category of litigation (table 1), the fraud categories in the taxonomy (table 2, panel A), specific fraud schemes included in the test variables (table 2, panel B) and the test variables (table 2, panel C). The tables describe four groups—the total sample and the three subsamples with no litigation, auditor litigation and other litigation.

The descriptive statistics (table 1, panel A) reveal, as expected, that companies with litigation are larger. However, the mean (median) total asset amounts are much greater for companies with other litigation than auditor litigation (\$7,273 [\$165] vs. \$1,977 [\$81]). The auditor-litigation subsample is distinguished by the highest average mean (median) for

²⁶ We exclude AAER number 1 as it refers to companies previously cited by the SEC in ASRs. We use AAERs beyond 675 that involve the set of 390 companies to update or add information about the variables.

²⁷ The determination of whether auditor litigation did or did not take place is made by reference to a sample of over 1,200 incidences of lawsuits against Big 6 and non-Big 6 firms (see Palmrose 1994); it includes but is not limited to observations in the auditor litigation database (Palmrose forthcoming). A few instances of auditor litigation were located (mostly for non-Big 6 firms) by using company names as key words (for all companies without auditor litigation) and searching over legal cases in LEXIS and disclosures in Dow Jones News Retrieval and LEXIS-NEXIS News Library and by reviewing company disclosures, as available, in annual reports and 10-Ks.

²⁸ Other litigation is identified from *Investor Class Action Monitors* and *Securities Class Action Alert* (1988 to 1997), legal notices in the *Wall Street Journal* (1985 to 1997), Dow Jones News Retrieval, LEXIS-NEXIS News Library, and company footnote disclosures. The latter is based on annual reports and 10-Ks available in published databases (e.g., LEXIS-NEXIS/NAARS) and on microfiche in libraries at USC and UCLA.

TABLE 1
Characteristics of 261 Firms Subject to SEC Enforcement Actions 1982-1995

	<i>Total Sample (n = 261)</i>	<i>No Litigation (n = 110)</i>	<i>Auditor Litigation (n = 98)</i>	<i>Other Litigation (n = 53)</i>
<i>Panel A: Selected Characteristics</i>				
Total Assets (in millions)				
Mean	\$2,817	\$1,419	\$1,977	\$7,273
Standard Deviation	12,500	9,124	6,326	22,520
Median	34	9	81	165
Years of Fraud				
Mean	2.06	1.93	2.39	1.74
Standard Deviation	1.68	1.98	1.43	1.33
Median	1.75	1.50	2.00	1.25
Severity of SEC Action (1-4)				
Mean	2.54	2.47	2.79	2.25
Standard Deviation	0.86	0.88	0.71	0.98
Median	3.00	3.00	3.00	3.00
Public Companies	96%	95%	97%	98%
NYSE	21%	9%	25%	40%
Bankrupt	26%	6%	54%	17%
Technology	9%	4%	14%	11%
Financial Services	25%	23%	24%	34%
IPOs	35%	27%	46%	30%
Big 6 Auditor	60%	38%	75%	77%
SEC Enforcement Action Against Auditors	39%	53%	34%	19%
Interim Statements Only	17%	15%	9%	34%
<i>Panel B: Client Industries</i>				
Agriculture, Mining, and Construction	11	6	2	3
Manufacturing	99	45	36	18
Transportation, Comm., and Utilities	14	6	6	2
Wholesale and Retail Trade	31	13	12	6
Finance, Insurance, and RE	69	26	25	18
Services	35	12	17	6
Other	<u>2</u>	<u>2</u>	<u>0</u>	<u>0</u>
Total	261	110	98	53

TABLE 2
Classification of Firms Subject to SEC Enforcement Actions by Fraud Category, Selected Fraud Schemes, Test Variables for Fraud Type, and Litigation Status

	<i>Total Sample (n = 261)</i>	<i>No Litigation (n = 110)</i>	<i>Auditor Litigation (n = 98)</i>	<i>Other Litigation (n = 53)</i>
<i>Panel A: Fraud Categories</i>				
(A) Fictitious Revenues	39%	36%	50%	26%
(B) Premature Revenue Recognition	33%	32%	40%	23%
(C) Misclassifications	8%	5%	13%	4%
(D) Fictitious Assets and/or Reductions of Expenses /Liabilities	13%	10%	19%	8%
(E) Overvalued Assets and Undervalued Expenses/ Liabilities	38%	30%	45%	43%
(F) Omitted or Undervalued Liabilities	15%	10%	20%	15%
(G) Omitted or Improper Disclosures	40%	33%	42%	51%
(H) Equity Frauds	11%	17%	4%	9%
(I) Related Party Transactions	20%	23%	20%	11%
(J) "Wrong Way" Frauds	10%	8%	10%	11%
(K) Illegal Acts	7%	10%	5%	6%
(L) Miscellaneous	2%	0%	2%	8%
<i>Panel B: Selected Fraud Schemes</i>				
(A1) Fictitious Sales Not Based on Firm Orders to Buy	18%	10%	30%	15%
(E1) Undervalued Allowance for Bad Debts or Loan Losses	19%	14%	22%	23%
(G10) Omitted or Improper Accounting Policy Disclosures	16%	15%	12%	23%

(Continued on next page)

TABLE 2 (Continued)

	<i>Total Sample (n = 261)</i>	<i>No Litigation (n = 110)</i>	<i>Auditor Litigation (n = 98)</i>	<i>Other Litigation (n = 53)</i>
(I1) Fictitious Related Party Sales	2%	2%	3%	0%
(I4) Related Party Disclosure Problems	17%	20%	16%	11%
<i>Panel C: Test Variables for Fraud Type</i>				
Frequent Frauds (H1), Measure 1: Categories A, B, E	76%	74%	81%	70%
Frequent Frauds (H1), Measure 2: Schemes A1, E1, G10, I4	51%	39%	62%	53%
Fictitious Transaction Frauds (H2): Categories A, D; Scheme I1	46%	42%	60%	28%

number of years of fraud (2.39 [2.00]) and for SEC action severity (2.79 [3.00]); the highest rates of bankrupt companies (54 percent), technology companies (14 percent) and IPOs (46 percent); and the lowest rate of interim-only statements (9 percent).²⁹ The other-litigation subsample has the highest rate of interim-only statements (34 percent) and the highest concentration of financial services firms (34 percent). Surprisingly, the no-litigation subsample has the highest rate of companies with SEC enforcement actions against auditors (53 percent). The no-litigation companies, in addition to being smaller (on average) and not bankrupt, tend not to have Big 6 auditors (38 percent Big 6). The auditor-litigation and other-litigation companies tend to have Big 6 auditors (75 percent and 77 percent, respectively). Panel B of table 1 gives a breakdown by industry of the total sample and each subsample. As mentioned above, the other litigation subsample has a higher concentration of financial services firms than the auditor-litigation and no-litigation subsamples, but there are no other remarkable differences in industry concentrations across subsamples.

Panel A of table 2 summarizes the overall and subsample frequencies for each category of fraud in the taxonomy (frequencies are the percentage of companies with some kind of fraud in the category). Overall, (G) omitted or improper disclosures occur most frequently in our sample (40 percent), closely followed by (A) fictitious revenues (39 percent), (E) overvalued assets and undervalued expenses/liabilities (38 percent) and (B) premature revenue recognition (33 percent). Note that, with the exception of disclosure frauds, the most frequent frauds in our sample are similar to those reported by Loebbecke et al. (1989). It is not surprising that the SEC would focus relatively more on disclosure issues than would be the case based on their frequency of occurrence. Consistent with this, two of the four most frequent individual schemes are related to disclosures about accounting policies and related party transactions (see table 2, panel B).

²⁹ Litigation can encompass statements and periods beyond those that are the subject of SEC enforcement actions.

In the auditor-litigation subsample, the most frequent fraud category is (A) fictitious revenues (50 percent); the auditor-litigation subsample has the highest frequencies for each of the categories A through F. On the other hand, over half (51 percent) of the other-litigation subsample has omitted or improper disclosures (G); it is this subsample's most frequent category.

Panel B of table 2 summarizes the overall and subsample frequencies for the individual fraud schemes included in the test variables. The auditor-litigation subsample has the highest frequencies for schemes A1 (fictitious sales not based on firm orders to buy) and I1 (fictitious related party sales). Panel C presents the overall and subsample frequencies for the test variables, i.e., companies having frequent frauds (H1) (both measures) and fictitious transaction frauds (H2). As predicted, the auditor-litigation subsample has the highest percentages of companies with frequent frauds (both measures) and fictitious transaction frauds.

VII. MULTIVARIATE ANALYSES

Full Sample: Tests of Hypotheses

This section presents the results of the multivariate analyses using the test and control variables for the full sample of 261 companies. Table 3 presents the correlations among the independent variables.³⁰ As expected, client size is significantly positively correlated with variables such as public status, exchange and Big 6 auditor. Also, it is notable that the two measures of frequent frauds are not significantly correlated; this is consistent with fraud schemes within categories varying substantially as to their frequency of occurrence.

Table 4 reports the logistic regression results.³¹ Panel A of table 4 presents the results of the regressions over the auditor-litigation and no-litigation subsamples; panel B presents the results of the regressions over the auditor-litigation and other-litigation subsamples. Each panel has two regressions; one with frequent frauds (measure 1) and fictitious transaction frauds as test variables and the other with frequent frauds (measure 2) and fictitious transaction frauds as test variables. The discussion of the results first focuses on the control variables, then on the test variables in each regression.

In the regressions over the auditor-litigation and no-litigation subsamples (table 4, panel A), coefficients of four control variables are significant at the .10 level or less in both regressions. They are (ln) total assets, bankruptcy, technology and severity of SEC action. The Big 6 auditor variable is significant in one regression. In the regressions over the auditor-litigation and other-litigation subsamples (table 4, panel B), coefficients of four control variables are significant at the .10 level or less in both regressions. They are bankruptcy, severity of SEC action, SEC action against auditor and annual (rather than interim) statements. The control variable for (ln) total assets is significant in one regression. All coefficients are positive as predicted; these variables increase the likelihood of auditor litigation.

As shown in panel A of table 4, the significant test variable for the auditor-litigation and no-litigation comparison is the second measure of frequent frauds (H1). This means that, for the auditor-litigation and no-litigation subsamples, more frequently occurring frauds increase the likelihood of litigation when considered at the individual scheme level

³⁰ Variance inflation factors (VIFs) indicated that multicollinearity was not a problem in these analyses. No VIF was over .10 and the average of the VIFs was between 1 and 2 for all analyses.

³¹ We also ran the regressions using OLS. The results were substantially similar and are not reported. Adjusted R²s were about .47 for the auditor/no-litigation and .25 for the auditor/other-litigation analyses. Outliers identified by OLS were dropped and analyses rerun; results were unchanged for test variables and substantially similar for control variables.

TABLE 3
Full Sample
Correlation Matrix for Independent Variables^a

	Public Status	NYSE	Bankrupt	Technology	Financial Services	IPO	Big 6 Auditor	Years of Fraud	Severity of Action	SEC Auditor	Annual Statements	Common Frauds 1	Common Frauds 2	Freq. Frauds 1	Freq. Frauds 2	Fictitious Tr. Frauds
Total Assets (ln)	.13 (.03)	.61 (.00)	.08 (.19)	-.04 (.52)	.35 (.00)	-.14 (.02)	.50 (.00)	.01 (.89)	-.31 (.00)	-.30 (.00)	-.10 (.11)	-.13 (.04)	-.15 (.01)	.05 (.43)	-.05 (.40)	-.12 (.06)
Public Status																
		.10 (.10)	-.02 (.77)	.06 (.31)	-.07 (.28)	.02 (.74)	.20 (.00)	-.05 (.40)	-.11 (.09)	-.21 (.00)	-.04 (.56)	.04 (.55)	.09 (.13)	.21 (.00)	.01 (.91)	.02 (.70)
NYSE																
			-.07 (.29)	.00 (.99)	.16 (.01)	-.25 (.00)	.34 (.00)	.00 (.94)	-.19 (.00)	-.21 (.00)	-.15 (.02)	-.08 (.20)	-.14 (.02)	.01 (.93)	-.13 (.03)	-.09 (.14)
Bankrupt																
				-.04 (.54)	.00 (.95)	.19 (.00)	.15 (.02)	.05 (.45)	.19 (.00)	-.06 (.34)	.03 (.58)	.06 (.32)	.12 (.05)	-.05 (.45)	.14 (.03)	.10 (.11)
Technology																
					-.19 (.00)	.10 (.10)	.07 (.25)	-.06 (.36)	.05 (.47)	-.14 (.02)	-.03 (.59)	.15 (.01)	.23 (.00)	.12 (.05)	.02 (.80)	.13 (.03)
Financial Services																
						-.13 (.04)	.06 (.30)	.00 (.99)	-.22 (.00)	.03 (.67)	-.09 (.14)	-.25 (.00)	-.23 (.00)	-.18 (.00)	.09 (.17)	-.31 (.00)
IPO																
							.04 (.49)	.02 (.72)	.24 (.00)	-.05 (.39)	.07 (.25)	.19 (.00)	.19 (.00)	.06 (.32)	.16 (.01)	.23 (.00)
Big 6 Auditor																
								-.06 (.30)	-.19 (.00)	-.52 (.00)	-.22 (.00)	-.02 (.80)	.03 (.67)	.10 (.12)	-.07 (.24)	.02 (.75)
Years of Fraud																
									.15 (.01)	.09 (.14)	.36 (.00)	.04 (.56)	.10 (.10)	-.09 (.13)	.12 (.05)	.10 (.09)
Severity of Action																
										.16 (.01)	.08 (.18)	.25 (.00)	.21 (.00)	.02 (.76)	.17 (.01)	.32 (.00)
SEC Action Auditor																
											.29 (.00)	-.06 (.37)	-.13 (.03)	-.04 (.51)	.09 (.14)	-.05 (.38)
Annual Statements																
												.07 (.78)	.08 (.19)	-.09 (.15)	.12 (.06)	.11 (.08)

(Continued on next page)

TABLE 3 (Continued)

Public Status	NYSE	Bankrupt	Technology	Financial Services	Big 6 Auditor	Years of Fraud	Severity of Action	SEC Action	Annual Statements	Common Frauds 1	Common Frauds 2	Freq. Frauds 1	Freq. Frauds 2	Fictitious Tr. Frauds
Common Frauds 1											.59 (.00)	.46 (.00)	.18 (.00)	.86 (.00)
Common Frauds 2												.27 (.00)	.46 (.00)	.51 (.00)
Frequent Frauds 1													.07 (.24)	.35 (.00)
Frequent Frauds 2														.11 (.09)

* The first number listed is the correlation; the number in parentheses is the significance level.

TABLE 4
Full Sample
Logistic Regression Results

Panel A: Dependent Variable: Auditor Litigation (1) vs. No Litigation (0) (n = 208)

<i>Independent Variable</i>	<i>Predicted Relation</i>	<i>With Frequent Frauds Measure 1</i>		<i>With Frequent Frauds Measure 2</i>	
		<i>Estimated Coefficients</i>	<i>p-value</i>	<i>Estimated Coefficients</i>	<i>p-value</i>
Intercept		-14.32	.01*	-14.46	.01*
Total Assets (ln)	+	.49	.01*	.51	.01*
Public Status	+	.75	.71	.54	.82
NYSE	+	-.42	.57	-.35	.64
Bankrupt	+	2.99	.01*	2.77	.01*
Technology	+	2.21	.01*	2.22	.01*
Financial Services	+	-.42	.51	-.62	.34
IPO	?	.19	.67	.18	.71
Big 6 Auditor	+/-	.80	.14	.93	.09*
Years of Fraud	+	.11	.28	.09	.47
Severity of Action	+	.84	.01*	.76	.02*
SEC Action Auditor	+	-.21	.67	-.13	.79
Annual Statements	+	1.24	.11	1.06	.19
Frauds Common to Frequent (Meas.1) and Fictitious Trans. Frauds	?	.32	.70		
Frauds Common to Frequent (Meas. 2) and Fictitious Transaction Transaction Frauds	?			.60	.42
Freq. Frauds (Meas. 1)	+	.12	.84		
Freq. Frauds (Meas. 2)	+			.95	.07*
Fict. Trans. Frauds	+	-.09	.91	-.10	.86
Model Summary Statistics					
-2 Log Likelihood		155.276		147.900	
Chi-Square for Model (15 df)		132.380		139.757	
p-value		.0001		.0001	
Percentage Correctly Classified		83.7%		83.2%	

* Significant at the .10 level or less (two-tailed).

(Continued on next page)

TABLE 4 (Continued)

Panel B: Dependent Variable: Auditor Litigation (1) vs. Other Litigation (0) (n = 151)

Independent Variable	Predicted Relation	With Frequent Frauds Measure 1		With Frequent Frauds Measure 2	
		Estimated Coefficients	p-value	Estimated Coefficients	p-value
Intercept		-8.97	.01*	-9.35	.01*
Total Assets (ln)	+	.19	.17	.25	.07*
Public Status	+	.40	.84	.87	.65
NYSE	+	-.36	.61	-.71	.31
Bankrupt	+	1.91	.01*	1.80	.01*
Technology	+	.61	.36	.60	.38
Financial Services	+	.20	.76	-.10	.88
IPO	?	.41	.41	.30	.55
Big 6 Auditor	+/-	.42	.52	.51	.42
Years of Fraud	+	.05	.79	.05	.78
Severity of Action	+	.57	.06*	.57	.06*
SEC Action Auditor	+	1.19	.09*	1.20	.08*
Annual Statements	+	1.55	.01*	1.45	.02*
Frauds Common to Frequent (Meas. 1) and Fictitious Trans. Frauds	?	2.00	.16		
Frauds Common to Frequent (Meas. 2) and Fictitious Transaction Frauds	?			-.09	.91
Freq. Frauds (Meas. 1)	+	1.17	.07*		
Freq. Frauds (Meas. 2)	+			-.20	.70
Fict. Trans. Frauds	+	2.91	.04*	1.39	.03*
<u>Model Summary Statistics</u>					
-2 Log Likelihood		135.509		139.371	
Chi-Square for Model (15 df)		60.205		56.343	
p-value		.0001		.0001	
Percentage Correctly Classified		76.8%		75.5%	

* Significant at the .10 level or less (two-tailed).

but not at the category level. Whether frauds involve fictitious transactions does not appear to matter in distinguishing between situations having no litigation and those having auditor litigation.

Turning to the results from the comparison of the auditor-litigation and other-litigation subsamples, the significant test variables are for frequent frauds at the category level (measure 1) (H1) and fictitious transaction frauds (H2) (table 4, panel B); the coefficients are positive as expected. Both of the hypotheses find support in regressions using the auditor-litigation and other-litigation subsamples. This means that, given that litigation occurs, auditors are more likely to be included as defendants on lawsuits that involve more frequent frauds or fictitious transaction frauds.

Additional Analyses: Alternative Accounting and Auditing Explanations

Because the types of fraud included in the test variables differ on multiple characteristics, it is possible that the results for frequent and fictitious transaction frauds do not reflect anticipation of judges' and juries' reasoning processes. Instead, they could reflect anticipation of a focus on important accounting or auditing dimensions of the frauds. While there is no known link between accounting and auditing characteristics and judges' and juries' reasoning processes, these elements of the frauds could be relevant to a plaintiff attorney when attempting to establish whether GAAP and GAAS were followed. We conducted additional analyses to rule out some of these alternative explanations.

For both measures of frequent frauds, the following alternative explanations exist. First, the accounts involved in the frequent frauds include accounts that are important to auditors because specific auditing standards exist for these accounts—revenues, receivables and/or inventory (SAS Nos. 1 and 67, AICPA 1973, 1991). The importance of these accounts could explain the results for frequent frauds. Second, the accounts involved in frequent frauds mostly relate to revenues and/or assets. Thus, two alternative explanations for the explanatory power of the frequent frauds variable are that it is related to whether the fraud involves assets or income and that judges or juries focus on the income statement (and revenues) or the balance sheet (and assets) when deciding to hold an auditor responsible for fraud. Third, most of the frequent frauds involve overstatements of assets and/or income as opposed to understatements. Because the conservatism convention recommends resolving uncertainties with understatements, the fact that most of these fraud types involve overstatements could account for the explanatory power of the frequent frauds variable.

For the second measure of frequent frauds, there are two additional confounds. First, two of the items (G10 and I4) relate to disclosures as opposed to transactions. If users (and judges and juries) make a distinction between items that affect financial statement totals and those that do not, results could simply reflect a relation between disclosure problems and litigation rather than between frequent frauds and litigation. Next, one of the items (I4) also involves related parties. Because there is a separate auditing standard covering related party issues (SAS No. 43, AICPA 1982), it is possible that auditors would be held more responsible for frauds involving these issues.

Many of these alternative explanations for the frequent frauds results also apply to the findings related to frauds involving fictitious transactions. Fictitious transaction frauds involve important accounts or just assets or revenues in general. Fictitious transaction frauds also involve overstatements of assets and/or income. Finally, one of the fictitious transaction frauds involves related parties.

To examine these alternative explanations, we constructed six dichotomous variables similar to the test variables to indicate the presence or absence of any fraud containing the six characteristics described above. For example, "important account" frauds include all

those in categories A and B and several schemes from categories C, D, E, F, G, I and J. If a company had any of these frauds, it would be assigned a 1 for the important account variable. As another example, for the overstatement vs. understatement variable, a company received a 0 if it only had frauds in category J (“wrong way” frauds); otherwise, it received a 1. Then, we ran logistic regressions comparing auditor litigation to no litigation and auditor litigation to other litigation, using the full sample of observations. Each regression included one of the alternative explanation variables and all the control variables used in the main analyses. These regressions did not include the test variables since they are highly correlated with the alternative explanation variables.

Table 5 presents the p-value for each of the alternative explanation variables in the no-litigation vs. auditor-litigation and other-litigation vs. auditor-litigation regressions, respectively (results for the control variables are similar to those in table 4 and are not reported). As shown in table 5, none of the accounting and auditing explanations significantly distinguishes between the auditor-litigation and no-litigation subsamples (first column) or the auditor-litigation and other-litigation subsamples (second column), with the exception of revenues in the auditor-litigation vs. other-litigation regression. Within the combined set of observations from the auditor-litigation and other-litigation subsamples, the revenue variable is highly correlated with the test variables both for frequent frauds (measure 1) and fictitious transaction frauds with correlations of .49 and .67, respectively. Further analysis supports the conclusion that it is not revenue frauds *per se* that are related to litigation; rather, consistent with our hypothesis, frequency of occurrence drives the results. For example, a Chi-square analysis of schemes within category A (fictitious revenues) by subsample indicates that the distribution across schemes is significantly different within the auditor-litigation and other-litigation subsamples ($X^2 = 4.97$, $.05 < p < .10$); this is due to higher than expected auditor litigation for the more frequent frauds and lower than expected auditor litigation for the less frequent frauds. Therefore, none of these alternative explanations appears to account for our results.³²

Additional Analyses: Reduced Samples

This section briefly discusses three additional control variables—stock returns, size of the fraud and audit deficiencies—which may affect the likelihood of auditor litigation. These data were available for less than half the sample observations (and the particular observations with data differed for each variable). While we ran logistic regressions adding each control variable (separately) to the model (see section V), most of the models were of questionable fit. Because of this, we do not report the logistic regression results. Even so, a primary purpose of considering these additional variables is to determine whether correlated omitted variables could affect the results. We provide information on the correlation of each of these variables—stock returns, size of the fraud and audit deficiencies—as they are discussed.

Research examines the proposition that large stock price declines attract lawsuits against auditors (e.g., Carcello and Palmrose 1994; Lys and Watts 1994; Stice 1991) and others (e.g., Francis et al. 1994a, 1994b; Jones and Weingram 1996a, 1996b, 1996c). The stock price change variable is a one-year return that begins six months before the date of

³² To focus on the cases that clearly involve fraud (i.e., those with recklessness akin to fraud and injunctive relief under the fraud provisions of the 1934 Act), we deleted observations that were originally coded as a (1) or a (4) for the severity variable (accounting disputes identified as Exchange Act Releases and administrative proceedings, and actions only against auditors, respectively). Our results are not sensitive to the analysis of just these cases; the test variables remain significant. Therefore, it is unlikely that our results are affected by the inclusion of cases that do not clearly involve financial reporting fraud.

TABLE 5
Full Sample
p-values and Signs of Coefficients for Alternative Accounting and Auditing Explanation
Variables from Logistic Regressions

	<i>Dependent Variable</i>	
	<i>Auditor- Vs. No- Litigation</i>	<i>Auditor- Vs. Other- Litigation</i>
Important Accounts (Revenue, Receivables, and Inventory Frauds)	.64 (-)	.75
Revenue Frauds	.55	.01
Asset Frauds	.45	.43 (-)
Overstatement vs. Understatement Frauds	.37	.83
Transaction vs. Disclosure Frauds	.27	.13 (-)
Related Party Frauds	.38	.80 (-)

the last financial statements cited by the SEC and ends six months after this date. Stock price data were available for only 114 companies in total. Table 6 (panel A) presents selected descriptive statistics for these observations. Although the auditor-litigation subsample has the largest stock price declines with mean (median) returns of -40 percent (-50 percent), none of the simple correlations between the test variables and stock returns is significant.

The likelihood of auditor litigation may increase with the size of the fraud (Kinney 1993). We determine the size of the fraud for each period based on its effect on net income, using both (ln) absolute dollars of the fraud and the percentage of net income misstated. The fraud dollars or percentage effect of the fraud is averaged over all the periods for which information was available. The amount of the fraud for each period was taken from the AAER, if possible. If the information was not available in the AAER, we used the difference between net income before and after restatement as reported on Compustat, if available. Otherwise, we searched LEXIS/NEXIS for disclosures related to restatement of the company's financial statements. Finally, we consulted company financial statements on microfiche (subsequent to the misstatements) for information about the misstatements.

Sufficient data on fraud dollars (percentages) were available for only 108 (118) of the 261 companies. Table 6 (panel B) provides descriptive data for the two measures of fraud size. The median, but not the mean, fraud dollars (percentage) is greatest for the auditor-litigation subsample. Further, fraud dollars is not significantly correlated with any of the test variables. However, fraud percentage is significantly negatively correlated with the test variable for frequent frauds (measure 2) in the combined auditor-litigation and no-litigation subsample and positively correlated with the test variable for fictitious transaction frauds in the combined auditor-litigation and other-litigation subsample. The negative correlation with the frequent frauds variable does not appear to account for our results and the positive correlation with the fictitious transactions fraud variable is based, in part, on only 19 other litigation companies.

Auditors may be held more responsible for certain types of audit deficiencies (Feroz et al. 1991; Kinney 1993; St. Pierre and Anderson 1984). To measure these deficiencies, we developed a taxonomy using the ten generally accepted auditing standards (GAAS) as categories (also see Campbell and Parker 1992).³³ We documented the types of audit deficiencies noted in AAERs for the subset of the sample ($n = 112$) in which auditors also were cited by the SEC. Table 6 (panel C) reports the frequencies for seven categories of audit deficiencies (all reporting violations are grouped together). The audit deficiency most often cited by the SEC is failing to acquire sufficient, competent evidence; 90 percent of

³³ The complete taxonomy includes several line items under each category and is available upon request.

TABLE 6
Reduced Samples
Selected Descriptive Statistics

	<u>Total</u>	<u>No Litigation</u>	<u>Auditor Litigation</u>	<u>Other Litigation</u>
<i>Panel A: Stock Price Data</i>				
Number of observations	114	36	47	31
Stock Returns*				
Mean	-24%	2%	-40%	-29%
Standard Deviation	57	71	42	50
Median	-37	-13	-50	-27
Beginning Stock Price*				
Mean	\$15.03	\$ 8.86	\$15.19	\$21.96
Standard Deviation	13.64	11.53	9.30	17.83
Median	11.50	4.41	13.88	16.50
Ending Stock Price*				
Mean	\$10.82	\$ 9.23	\$ 9.02	\$15.41
Standard Deviation	13.18	11.76	10.47	17.17
Median	5.78	3.16	5.88	10.00
<i>Panel B: Size of the Fraud</i>				
Number of observations	108	39	50	19
Amount of Misstated Income (millions)				
Mean	\$12	\$ 7	\$12	\$22
Standard Deviation	34	32	25	54
Median	2	1	2	1
Number of observations	118	42	52	24
Percent of Misstated Income				
Mean	192%	288%	175%	67%
Standard Deviation	454	590	422	85
Median	79	80	82	52

(Continued on next page)

TABLE 6 (Continued)

	<u>Total</u>	<u>No Litigation</u>	<u>Auditor Litigation</u>	<u>Other Litigation</u>
<i>Panel C: Audit Deficiencies</i>				
Number of observations	112	56	44	12
Violations of General Standards				
(A1) Training and Proficiency	19%	23%	11%	25%
(A2) Independence	18	16	21	17
(A3) Due Care	47	48	48	42
Violations of Fieldwork Standards				
(B1) Planning and Supervision	73%	77%	71%	67%
(B2) Internal Control	16	13	18	25
(B3) Evidence	90	96	80	100
Violations of Reporting Standards				
(C) All	31%	29%	30%	50%

* Beginning price determined 6 months before the date of the last financial statements cited by the SEC, ending price determined 6 months after this date, return calculated as (ending price – beginning price)/beginning price.

the reduced sample has this deficiency. Although independence violations are relatively infrequent, independence is the only category for which auditor litigation has the highest rate. There are a few significant correlations of audit deficiencies with the significant test variables. In the combined auditor-litigation and no-litigation subsample, the second measure of frequent frauds is negatively correlated with evidence violations and positively correlated with reporting violations. In the combined auditor-litigation and other-litigation subsample, the first measure of frequent frauds is negatively correlated with planning violations. The positive correlation between frequent frauds and reporting violations seems more likely to be a spurious result than an alternative explanation for our findings. The negative correlations between the test variables and audit deficiencies do not explain our results.

To summarize, we considered three additional control variables—stock returns, size of the fraud and audit deficiencies—omitted from the models used to tests the hypotheses because of data limitations. The omission of these variables from the analysis of the full sample does not appear to affect our results in a substantive way, but we cannot completely rule out this possibility.

VIII. CONCLUDING REMARKS

This study investigated whether fraud type is related to the likelihood of litigation against auditors.³⁴ The results provide some support for our two primary hypotheses—auditors are more likely to be sued over more frequent frauds and fictitious transaction frauds. The frequent frauds variable was significant at the scheme level in auditor-litigation vs. no-litigation analyses and at the category level in auditor-litigation vs. other-litigation analyses. Additionally, in auditor-litigation vs. other-litigation analyses, fictitious transaction frauds were more likely to involve auditors as defendants. Further analyses ruled out various alternative explanations for these findings. In particular, the results cannot be primarily explained by whether the fraud involved important accounts (i.e., revenues, receivables and inventory), revenues, assets, overstatements (rather than understatements) of assets and/or income, disclosures, or related parties.

This study makes several contributions. It documents that fraud type matters in auditor litigation and provides evidence on specific characteristics of fraud that are related to litigation against auditors. Documenting that fraud type matters is a necessary first step to better understand the role of fraud in auditor litigation. The results provide preliminary evidence of a more significant role for fraud type in explaining whether auditors are included as defendants given that financial reporting litigation occurs than in explaining whether any financial reporting litigation (with auditors as defendants) occurs. Still, given the importance of economic considerations in the latter, a finding that fraud type matters in any way is important.

Additionally, the control variables provide evidence on other factors that are related to auditor litigation when fraud is present; some of these factors have not been previously examined, e.g., annual (vs. interim) statements and severity of SEC enforcement actions. Consistent with prior research (e.g., Carcello and Palmrose 1994; Lys and Watts 1994; Palmrose 1988; St. Pierre and Anderson 1984; Stice 1991), for auditor-litigation vs. no-litigation analyses, client size, bankruptcy and client industry (technology) are consistently significant. Severity of the enforcement action also is significant. For auditor-litigation vs. other-litigation analyses, client bankruptcy, severity of action, SEC actions against the auditor and whether annual financial statements are involved are consistently significant. These findings extend extant research which finds client financial condition and the presence of SEC enforcement actions to be significant (e.g., Carcello and Palmrose 1994).

This study is the first to provide more than limited evidence on financial reporting and disclosure litigation for companies with SEC enforcement actions (see Dechow et al. 1996; Feroz et al. 1991). This evidence has some potential public policy implications. Recall that 42 percent of our sample has no litigation, in spite of severe enforcement actions (median of 3, i.e., injunctions) and SEC enforcement actions against auditors (53 percent). In part, no lawsuits may be due to the economics of litigation in this setting, especially for class-action attorneys on contingent fees (Alexander 1991). Importantly, the evidence that over 40 percent of the companies with SEC enforcement actions have no litigation suggests that litigation alone is not sufficient for deterrence of fraudulent financial reporting; both regulatory enforcement and litigation may be required.

³⁴ We attempted to examine litigation outcomes (resolutions) in addition to occurrences. However, there were only 73 observations with total resolution data. While 46 of the 73 involved auditors, we did not necessarily know the auditors' portion of the total resolution. We ran OLS regressions with (ln) total payments (including zero) as the dependent variable (payments were inflation-adjusted to December 1996 using the CPI-U); independent variables consisted of the control variables (section 5), a variable indicating auditor defendants, and test variables for H1 and H2. Consistently significant coefficients were (ln) total assets (positive), financial institutions (negative), and auditor defendants (positive); years of fraud was significant (negative) in one regression.

Additionally, this study is the first to examine the effects of fraud characteristics that affect the strength of a plaintiff attorney's case against an auditor and, thus, result in a higher likelihood of litigation against the auditor. Examining these variables explicitly recognizes that plaintiff attorneys may anticipate the behavior of judges and juries and include auditors as defendants when they believe judges and juries are more likely to hold the auditor responsible for not detecting a fraud. Because we use archival data, our statements regarding this process are indirect at best. However, the use of archival data allows for the examination of revealed decision behavior within the context of multiple economic and other factors that previous studies have found to be related to auditor litigation. Many of these factors would be difficult to incorporate into an experimental setting. Further, the finding that different types of fraud result in differential likelihoods of litigation in the complex "real world" setting reinforces the usefulness of the study of decision making in litigation settings.

Another benefit of our development of a taxonomy of fraud types is the documentation of the frequency of occurrence of different types of fraud schemes. This information is perhaps more important to practicing auditors in designing tests to detect fraud than knowledge of "red flags." Red flags only allow auditors to estimate the risk that fraud is present somewhere in the financial statements, while improved knowledge of frequencies could help auditors better focus their testing efforts.

This study is not without limitations. First, the use of companies subject to AAERs as a fraud sample raises concerns about a selection bias related to the SEC's agenda. Although we addressed this issue through a literature review and a comparison of our sample to other fraud samples, future research could strengthen our knowledge of the representativeness of this sample vis-à-vis the population of companies with fraudulent financial reporting.

Second, we do not develop a prediction model that audit firms could use for screening clients. Developing a model that would predict the probability a client will have a frequent or fictitious transaction fraud and/or recognizing the relevance of these variables in litigation prediction modeling would be useful avenues for future research. When developing such a model, researchers may want to consider further investigation of whether frequent frauds should be determined at the scheme or category level when there is variation of frequencies within categories, as was the case in this study.

Third, the use of archival data to examine factors that affect the strength of a case does not allow us to fully disentangle the effects of variables that are correlated in the environment or to make direct statements about the decision processes of plaintiff attorneys. Fourth, the use of dichotomous variables for frequent and fictitious transaction frauds may not capture the intricacies of judges' and juries' reasoning about auditor responsibility. An experiment could manipulate (or hold constant) correlated variables and systematically manipulate the types of fraud to better isolate variables' effects and make stronger statements about decision processes. Finally, we do not directly study the judgments of juries and judges, as do other studies in accounting (e.g., Anderson et al. 1995; Buckless and Peace 1993; Jennings et al. 1993; Kadous 1996). Rather, we infer something about plaintiff attorneys' decisions that are based on an anticipation of judges' and juries' behavior. Future research could further examine the factors that directly affect judges' and juries' attributions of auditor responsibility for fraud.

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Low Balling, Legal Liability and Auditor Independence

Chi-Wen Jevons Lee

Tulane University and Hong Kong University of Science and Technology

Zhaoyang Gu

Tulane University

ABSTRACT: We construct a dynamic multi-agent moral hazard model to analyze the interactions among the firm owner, the manager and the auditor. Moral hazard may arise in hierarchical agency because a rational monitoring agent may accept a side payment from the monitored agent for misrepresenting information to the principal. This multi-agent moral hazard problem is the essence of the concern for auditor independence. We show that a "low-balling" compensation scheme and the auditor's legal liability constitute an efficient dynamic contracting mechanism for hierarchical agency. In particular, low balling serves as a substitute for legal liabilities for maintaining auditor independence. Low balling reduces the transaction costs associated with the audit engagement relative to the flat-fee structure and can actually improve auditor independence.

Key Words: *Low balling, Auditor independence, Collusion, Auditor's legal liability, Moral hazard, Hierarchical agency.*

I. INTRODUCTION

This paper examines low balling, legal liability and auditor independence in a hierarchical agency model. To analyze the interactions among the firm owner, the manager and the auditor, we construct a dynamic multi-agent model. Our analysis shows that although the optimal compensation scheme for the auditor resembles "low introductory pricing" or "predatory pricing," it may in fact serve as an efficient mechanism for monitoring. The Securities and Exchange Commission (SEC) has been reluctant to accept this compensation scheme, commonly known as "low balling" in professional accounting practice, for fear that it may impair auditor independence. In our model, we show that this negative view of low balling is unjustified.

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Low balling in our model is a feature of dynamic contracting, and auditor independence is a multi-agent moral hazard problem. The static multi-agent moral hazard models in Antle (1982, 1984), Baiman et al. (1987) and Baiman et al. (1991) adequately addressed the issue of auditor independence without shedding light on the issue of low balling. The dynamic single-agent models in DeAngelo (1981), Dye (1991), Kanodia and Mukherji (1994) and Gigler and Penno (1995) explained some aspects of low balling but did not address auditor independence in relation to collusion between agents.

Auditors' legal liability to shareholders and other investors is a significant aspect of auditing. Although Dye (1993), Moore and Scott (1989) and Teoh (1992) related auditor independence to auditors' legal liability, the literature has yet to provide a model directly incorporating both low balling and legal liability. By developing a dynamic multi-agent moral hazard model, we present a formal structure for simultaneously analyzing low balling, auditors' legal liability, and auditor independence. In our model, low balling is viewed as creating a relation between auditors and owners rather than between auditors and managers. Low balling and legal liability constitute an efficient dynamic contracting mechanism for hierarchical agency. In particular, low balling creates the same kind of disincentive for unscrupulous auditor behavior as does auditors' legal liability, but does so for less cost. Relative to the flat-fee structure, low balling can reduce the transaction cost associated with the audit contract and actually improve auditor independence.

The analysis is organized as follows. Section II summarizes the debate in the literature on the issues of low balling, auditor independence and legal liabilities. In section III, we construct a dynamic model of hierarchical agency. In section IV, we analyze the conditions for eliciting high effort from the manager and faithful monitoring from the auditor. We show that low balling and auditors' legal liability create an efficient mechanism to ensure auditor independence. Section V analyzes the admissible audit contracts and determines the optimal amount of low balling. Section VI deals with comparative statics. Conclusions follow in section VII. Some mathematical proofs are provided in the appendix.

II. THE DEBATE

Auditor independence is a vital issue in the market for auditing services. Many definitions exist in the literature.¹ We define auditor independence as the absence of collusion between the auditor and the manager of the client firm. It has often been alleged that the competition for audit contracts may enable the manager of an audited firm to entice the auditor to conceal disadvantageous information from or even to misrepresent information to the owners and the general public. As a result, several auditing practices have come under scrutiny for their potential to undermine auditor independence. Of these, perhaps the most contentious is "low balling."

The term "low balling" refers to the deep initial discount granted by an external auditor when she enters a potentially long-term audit engagement with a client firm. Thus, low balling is a marketing strategy akin to "low introductory pricing." The SEC, various advocates of the public interest, and concerned citizens have viewed the practice with

¹ DeAngelo (1981, 116) defined the "level of auditor independence" as "the conditional probability that, given a breach has been discovered, the auditor will report the breach." Magee and Tseng (1990, 322) took "a lack of independence" to mean that "an auditor's decisions are not consistent with his or her beliefs about a reporting policy." Antle (1982, 1984) and Baiman et al. (1991) developed a conceptual framework for analyzing auditor independence as collusion between the auditor and the manager.

suspicion.² In 1978, the U.S. Congress directed the Commission on Auditors' Responsibilities to examine the issue of auditor independence. The Commission (1978), publishing its findings in *Report; Conclusions, and Recommendations* (what is now often called the *Cohen Report*) took a distinctly negative view of the practice. The *Cohen Report* (1978, 121) argued that low balling may impair auditor independence by creating the equivalent of a bail bond held by the manager of the audited firm who could then threaten its usurpation should the auditor reveal information harmful to the manager. The auditor, by offering to "low ball," signals to the manager her readiness to be pliant.

We think that the argument of the *Cohen Report* is flawed in that it casts the external auditor solely as an agent of the manager and ignores the auditor's legal liability to shareholders. In the absence of legal liability, one would not expect auditors to be good watchdogs for the owners of firms. The continued existence of the external auditing institution would then imply that shareholders are either irrational, ignorant, or both. This implication is obviously unpalatable in theory and untrue in practice. The accounting literature suggests a different relationship among the manager, the auditor and the shareholders. For example, Antle (1982, 1984) and Baiman et al. (1991) treated the auditor as another agent, *alongside* the manager, employed by the owner. This treatment is more in line with the notion that the external auditor serves as a watchdog for outside shareholders who often have ultimate control over the hiring and firing of the external auditor through their influence on the audit committee of the firm. Even though in many cases the auditor appears to be hired by the manager, shareholders have the statutory right to fire the auditor and to sue for damages. We construct a model in which the combination of low balling and the auditor's legal liability maintains auditor independence. Nevertheless, in our view, the concept of a bail bond is insightful. By explicitly incorporating the auditor's legal liability into our analysis, we apply the bail bond concept of the *Cohen Report* to derive a totally opposite conclusion.

In our multi-agent moral hazard model, the right to hire and fire the auditor lies in the hands of the owner.³ In particular, the owner hires a manager to operate the business. An auditor is hired to monitor the manager. Monitoring is hierarchical: the auditor monitors the manager, and the owner in turn monitors the auditor-manager relationship.⁴ The auditor is not inherently loyal to the owner. She may well be influenced by a manager willing to

² The SEC (1978) is so wary of this practice that it requires disclosure of any auditing fee which is "significantly less than what would cover expected direct costs...." For empirical studies on low balling, see Baber et al. (1987), Francis (1984), Francis and Simon (1987), Palmrose (1986), Simon and Francis (1988) and Simunic (1980). Schatzberg (1990) did an experimental study on this issue. Moreover, the suspicion exists that low balling may be a predatory pricing strategy of the Big 5 certified public accounting firms, unfair to smaller firms, and ultimately undesirable for society. For theoretical discussions of predatory pricing, see Saloner (1987) and Milgrom and Roberts (1982). For evidence of concern for auditor predation, see Areeda and Turner (1975) and Causey (1979).

³ This assumption may not be exactly observed in the institutional reality. By starting from this extreme case, we are able to abstract from other complications and show the unexpected result that low balling actually enhances auditor independence. Section VII will briefly discuss the implications when the manager also has limited power to hire and fire the auditor. In a model of moral hazard, the right to hire is, in fact, not crucial to our conclusion.

⁴ For the literature on multi-agent contracting and monitoring, see Bohn (1987), Demski and Sappington (1984), Mookherjee (1984) and Ma et al. (1988). In Bohn (1987), the watchdog is another shirker but is incorruptible. Lui (1985, 1986) analyzed bribery between a government agent and consumers. Various models of auditors' behavior can be found in Ng and Stoeckenius (1979), Balachandran and Ramakrishnan (1980), Evans (1980), Antle (1982, 1984), Baiman, et al. (1987), Moore and Scott (1989), Dye (1993), Dye et al. (1990), Melumad and Thoman (1990), Baiman et al. (1991), Teoh (1992) and Antle and Nalebuff (1991). All these models are static in nature. A dynamic model is more suitable for analyzing the issue of low balling.

offer a sufficient side payment for an audit report biased in the manager's favor.⁵ Such side payments may cause failure in the markets for CPAs and professional managers. We argue, however, that the combination of low balling and auditor legal liability is an efficient mechanism for preventing the market failure. This mechanism requires the auditor to put up a bail bond *with the owner*, to be forfeited if she is found (not necessarily convicted) to have colluded with the manager.⁶ The bail bond created by low balling is then a convenient and inexpensive handle with which an owner can exact honest behavior from the auditor. By accepting a low-balling contract, the auditor signals her willingness to act in the interest of the owner.

The owner can also be rational and opportunistic. If the initial discount required is excessive, an auditor may refuse the contract for fear of owner opportunism: the auditor may be dropped after working for a very low fee in the first period. In our model, both the reputation effects and the owner's costs of re-hiring determine the maximum extent of low balling. Thus, here as in DeAngelo (1981), the equilibrium degree of low balling is affected by the auditor's incumbency advantages resulting from the owner's switching costs. Our analysis leads to the following results:

- Low balling is an efficient mechanism for hierarchical monitoring and can strengthen auditor independence rather than merely not diminishing auditor independence;
- Low balling is a low-cost substitute for litigation;
- Deep initial discounts may simply reflect auditor price competitiveness; and
- Market exclusion of auditing firms unable to give initial discounts may be healthy.

Our results are especially relevant to the growing subset of firms where outside directors dominate the audit committees,⁷ and where audit committees are involved in the decisions on hiring/firing the auditors.⁸ In addition to audit committees, investors get directly involved in many cases.⁹ During the past decade, shareholder activism in the area of corporate

⁵ The manager-auditor side payment can take many forms, some of which are *prima facie* legal. In many large corporations, the auditor is appointed by the manager on behalf of the shareholders. The manager can use the appointment itself as a side payment to sway the auditor. Some side payments can be legally justified, such as granting a consulting contract. Some are difficult to trace, for example, employing the auditor as a financial officer in the future, getting a job for the auditor's offspring, or providing the auditor with important business contacts. Therefore, preventing a side payment can be legally difficult and expensive.

⁶ In contrast, the *Cohen Report* regards low balling as putting up bail *with the manager*. One should bear in mind that once the owner detects collusion, *both* the manager and the auditor will be punished. The forfeited bail will not end up in the hands of the manager.

⁷ Practically all public firms now have audit committees (Conference Board 1993). Kesner (1988) showed that 95 percent of the audit committee members in her study of 250 *Fortune* 500 firms in 1983 are outside directors. Starting from 1978 (the same year of the *Cohen Report*), NYSE required all firms listed on its exchange to have an audit committee consisting *entirely* of independent directors.

⁸ According to a survey, Conference Board (1979, 14), audit committees are viewed as an "investor safeguard," and an almost universal function of the committees is some participation in the selection of external auditors. The survey revealed that the audit committees are involved in most cases of auditor changes and that about one quarter of those committees involved initiated the change (Conference Board 1979, 18). It also reported that from the auditor's viewpoint, "there is evidence that, while auditing firms may have felt in the past the client was the company and its management, at least some firms and practitioners are shifting their sights and acknowledging that they are, in fact, engaged by the board and have a primary responsibility to serve the interest of the owner" (Conference Board 1979, 18). See also the editorial "Auditing the Auditors" in the *Economist* (1992, 16).

⁹ In 22 percent of companies surveyed in the Conference Board (1979), a clear stipulation required the board to present the choice of auditors to the shareholders for ratification. This practice was followed by 71 percent of the surveyed companies, although many of them may not have such written stipulations (Conference Board 1979, 15). Various issues of Investor Responsibility Research Center's *Corporate Governance Bulletin* have documented shareholder proposals, such as "shareholder ratification of auditors" (1991, 25), "use bids to hire auditors" (1994, 30), and "new auditor every four years" (1995, 25). One proposal suggests to "require surety for auditors" (1996, 31), i.e., to punish the auditor in case of an audit failure. In light of our model, low balling can be viewed exactly as such surety for auditors.

governance has significantly heightened, partly due to the increasing number of institutional investors. Our owner-contracting approach provides some insights about the consequences of this trend.

This paper provides a more complete analysis of low balling and auditor independence than is currently available in the literature. Both low balling and auditor independence are treated as endogenous variables in an interactive model with three rational rent-seeking economic agents—the owner, the manager and the auditor. Our results are consistent with many findings in the prior literature and offer several new insights which we describe below. First, in all studies in the literature of which we are aware, the owner plays a passive role. Our model has an active owner and an auditor subject to legal liability, and in this model low balling can *improve* auditor independence.

Second, as in all studies in the literature, we assume non-zero switching cost. We discuss two types of switching costs: the transaction cost of auditor change and the punishment for the owner's opportunistic termination of the audit contract. An admissible audit contract uses the total switching cost to set the upper bound to preclude owner opportunism. In this paper, the auditor's start-up cost (as in DeAngelo [1981]) is part of the transaction cost that sets the upper bound for the amount of low balling.

Third, our results do not depend on an assumption that the auditor has all the bargaining power, as modeled in DeAngelo (1981), Magee and Tseng (1990) and Gigler and Penno (1995), or that the client firm has all of it, as modeled in Dye (1991) and Kanodia and Mukherji (1994). Low balling exists no matter who has the bargaining power. Moreover, low balling in our model does not necessarily mean that the first-period auditor fee is below cost. We find it suitable to define low balling more generally as an auditor payment scheme in which the first-period payment is lower than payments in subsequent periods. We then establish conditions under which the audit fee in the first period will be below cost. The same treatment can be given to the DeAngelo, Magee-Tseng, Gigler-Penno, Dye, and Kanodia-Mukherji models; in these models, below-cost low balling obtains only if the market for auditing services is sufficiently competitive, a result naturally generated by our model.

Fourth, in our model low balling is an instrument to achieve auditor independence more efficiently than reliance on auditor liability alone. When the shareholders have the right to fire the auditor and to sue for damages, low balling exists irrespective of the observability of the auditor's quasi-rents. This result is in contrast to Dye's (1991) conclusion that the unobservability of the auditor's quasi-rents from future engagements is both the necessary and sufficient condition for low balling.

III. THE MODEL

Consider an infinite-horizon model in which the owner of a firm hires agents to act on her behalf.¹⁰ Specifically, she employs a manager to handle production and an auditor to verify the reported information. The owner desires to maximize the residual value of the firm. Each agent's inter-temporal utility is the infinite risk-adjusted discounted sum of the single-period utilities. Since our focus is on the audit contract, we keep the manager's contract with the owner as simple as possible. In particular, we make two assumptions concerning the manager's utility function to increase the tractability of the model: (1) time additivity and (2) local linearity. The assumption of linearity (risk neutrality) does not

¹⁰ A two-period model turns out to be much messier than the infinite-period model. The optimal solution of infinite horizon dynamic programming is recursive. The time index can be dropped from each variable. The "going concern" assumption is more natural for firms than the "two-period" assumption. Very often, the finite-period assumption is adopted for tractability. In our model, the more natural assumption is more tractable.

eliminate the moral hazard problem (e.g., Milgrom and Roberts 1992, chap. 7), but significantly simplifies our analysis. Specifically, in the neighborhood of the equilibrium, the manager's one-period utility in monetary units is assumed to be $U(S, A) = S - \rho A$, where $\rho > 0$ is a preference parameter, S is his monetary compensation, and A is his "action" in the production process. $A \in \{A_h, A_o\}$ and $A_h > A_o$; that is, A_h is the more taxing action. For convenience, we normalize the difference $A_h - A_o$ to be 1; hence, ρ stands for the differential disutility of selecting the action preferred by the owner rather than the less preferred one. We assume that the owner's preferred action requires more managerial effort.

Let S_h and S_o be the manager's reservation compensation levels if he performs A_h and A_o , respectively. When managerial effort A is observable at zero cost, the first best contract obtains, as stated in equation (1)—the manager is indifferent between the two contracts, (A_h, S_h) and (A_o, S_o) .

$$U(S_h, A_h) = U(S_o, A_o) = \mu, \quad (1)$$

where μ is the manager's market value. Equation (1) implies that $S_h - S_o = \rho(A_h - A_o) = \rho$; the optimal contract just compensates the manager for working hard. The net present value of a continuous employment contract q_1 is the sum of future $U(S, A)$ adjusted by a discount factor r , where $r = 1/(1 + \text{discount rate})$. Under equation (1), $q_1 = \mu/(1 - r)$. The unobservability of A raises the issue of moral hazard. It is necessary to design a contract different from the first best, such that (A_h, S_h) is weakly preferred by the manager to (A_o, S_o) .

The firm's true net income is $Q(A)$, with $Q(A_o) < Q(A_h)$. The owner can observe the true net income at a very high cost, C . An economical way for the owner to learn about the true net income is to hire an auditor, who has delegated expertise for monitoring the manager (Demski and Sappington 1987). The auditor can observe Q at a relatively low per-period cost that we normalize to zero.¹¹ Thus, $C > 0$ indicates that the owner is less efficient than the auditor in monitoring the manager. However, the auditor's and manager's loyalty to the owner, and hence the reliability of their reported net income, cannot be presumed. Contract law allows the owner to dismiss the agents for misconduct and to sue them for damages. Agent misconduct here means collusion between the manager and the auditor so that the manager chooses A_o but the auditor supports the false report of $Q(A_h)$.

The owner takes a randomized strategy to investigate collusion with a probability π and the cost per investigation C .¹² In this model, all the decision variables are assumed to be common knowledge to the players of the game. Therefore, even though the investigation intensity π is chosen by the owner, the auditor and the manager can also deduce the optimal investigation intensity that a rational owner would undertake to prevent collusion.¹³ We assume that once an investigation is undertaken, the true Q is revealed to the owner.

¹¹ The start-up cost for first auditing is usually much higher than that for subsequent auditing. We will discuss the issue of the start-up cost in section V.

¹² Casual observation supports the existence of owner-initiated investigation and additional exogenous monitoring mechanisms. For example, audit committees composed mostly (entirely for NYSE firms) of outside directors do conduct costly investigations independent of managers and auditors. Conference Board *Corporate Directorship Practices: The Audit Committee* (1979, 49) states that "many [audit] committees have become involved in investigations into possible illegal or 'questionable' payment, for example, and any number of these committees have engaged outside legal counsel or other expert help (including outside auditors other than the company's own) to assist with the investigative process and provide the committee members with guidance in interpreting the findings." Although shareholders do not appear to directly pay for investigation, the cost is imbedded in firm value, i.e., in the value of the stocks they hold.

¹³ Another way for the auditor and the manager to learn of the equilibrium investigation intensity is through the repeated action by the owner in this infinitely repeated game.

Because audit effort is not an important issue here, we assume that the auditor's single-period utility is just her income. According to the (AICPA 1997) the audit fees should be independent of the net income of the audited firm. For an auditor to accept the engagement, the present value of the fees she expects from a given client should equal her market value, $R \geq 0$.¹⁴ The specific value of R is assumed to be determined by a number of forces exogenous to our model, for example, competition among auditors, the relative bargaining strength of the auditor and the owner, and the size and complexity of the auditing job involved. According to the 1934 Securities Exchange Act, the auditor will be dismissed and then sued for damages, if ever found to have prepared a false audit report. To explicitly evaluate the effect of legal liability and its relation to low balling, we assume that in cases where collusion is detected, the dismissed auditor is required by the court to pay damages of η_a .¹⁵ For simplicity, we normalize the auditor's post-dismissal income to zero. In a similar way, when collusion is detected, we assume that the manager is dismissed and required to pay damages of η_m , and that his future income is normalized to zero.

To eliminate the trivial case in which there is no room for moral hazard and monitoring, we assume the owner can obtain higher residual income from demanding the manager's high effort than from giving the manager low pay and leaving him alone.

$$Q(A_h) - S_h - \pi C > Q(A_o) - S_o, \quad (2)$$

where π refers generally to the investigation intensity the owner would choose in a given period. Inequality (2) is a necessary condition for a rational owner to have the incentive (i) to contract with the manager for high effort even though she knows the manager may shirk, (ii) to contract with the auditor for delegated monitoring even though she knows the manager and the auditor may collude, and (iii) to adopt a random investigation strategy even though such investigation is costly. We assume this condition holds for all admissible audit contracts.

In an environment where many auditors compete for the engagement, only the one who proposes the least costly contract to the owner will win the bid. The owner's total audit-related costs consist of two parts: audit fees for the external auditor and the monitoring cost. As we will show, the monitoring cost depends on the investigation intensity, which, in turn, depends on the audit fee payment pattern. Given the market-determined total audit fee, R , the auditor, to win the contract, then has to come up with a fee payment pattern that results in the lowest monitoring cost to the owner. Our primary task is to examine two alternative compensation schemes for the auditor.

In Scheme 1 (a flat-fee scheme), the auditor requests a flat fee, F , from the owner, which is the same for each period, until her dismissal. In Scheme 2 (a low-balling scheme), the fee in the first period, L , may differ from the constant fee in each subsequent period, H . Given that collusion is effectively prevented and the auditor is thus never dismissed, the present value of these two schemes is the same.

¹⁴ Normalizing the discounted sum of all the auditor's costs to zero, R becomes the quasi-rent the auditor can earn if she remains honest. In an imperfectly competitive market for auditor services, $R > 0$. In DeAngelo (1981), $R = 0$ is a necessary condition for low balling. In this paper, we show that low balling can take place for $R > 0$.

¹⁵ The legal liability of the auditor η_a is assumed to be fixed here, although it need not be considering possible punitive damages. In reality, legal liability may be endogenous and vary with the amount of loss, but in our simplified two-action setting there is only one possibility of collusion and thus, loss. The setting of optimal liabilities is beyond the scope of this paper. Making the auditor's legal liability an endogenous variable is unlikely to provide more insights about the issues of concern in the model. The same can be said of the manager's legal liability η_m .

$$\frac{1}{(1-r)} F = R = L + \frac{r}{(1-r)} H, \quad (3)$$

where $0 < r < 1$ is the discount factor. Although the auditor is indifferent between the two schemes, competition drives her to set the scheme that is best for the owner. Corresponding to these two schemes, the owner will conduct investigation with similar investigation intensity patterns. In particular, under the flat-fee scheme, the investigation intensity, π_t , is the same for all periods. Under the low-balling scheme, the investigation intensity in the first period, π_1 , may differ from the constant investigation intensity in each subsequent period, π_k .

In the following sections, we will characterize the audit contracts and show that the monitoring cost is lower under Scheme 2 than under Scheme 1. The reason is that Scheme 2 will result in lower required investigation intensity in periods after the first than Scheme 1. Moreover, $L < H$, so that Scheme 2 is indeed a low-balling scheme. Hence, the auditor will choose a low-balling contract to facilitate the achievement of independence.

IV. SIDE PAYMENTS AND CONTROL MECHANISM

The manager in this model may offer a side payment B to the auditor to report net income as $Q(A_h)$ for receiving salary S_h , while choosing A_o and producing actual net income of $Q(A_o)$. The manager's utility in a successful collusion may be greater than μ if B is not too large. Of course, both parties in the collusion must weigh the possibility of being detected, to which we now turn.

As in Tirole (1986) and Kofman and Lawarrée (1993), we do not dwell on the bargaining between the manager and the auditor. We, instead, find for each period the *collusion set* G containing all the side payment values which would make both the manager and the auditor better off with collusion.¹⁶ Shrinking G in all periods to a null set implies successfully eliminating collusion and achieving auditor independence. To characterize G , we alternately let the manager and the auditor be "price-takers" in the negotiation for a collusion, that is, those who can choose only whether to accept or offer a side payment but cannot determine the magnitude of it. The maximum side payment a price-taking manager is willing to pay and the minimum side payment a price-taking auditor is willing to accept together define G as a set of B feasible for collusion. If the manager's maximum is smaller than the auditor's minimum, G is *null*.

To accommodate a Scheme 2 audit contract, in which the auditor's compensation in the first period may differ from those in the rest of the periods, we will analyze the agents' decision problems in the first period separately from those in subsequent periods. Scheme 1, a special case of Scheme 2, needs little additional analysis.

The Maximum Side Payment the Manager Is Willing to Offer

In a period k after the first period, if he does not make any side payment, the manager must work hard, and his utility for that period would be μ . If he chooses A_o and agrees to pay a sufficiently large side payment B_k to the auditor, the auditor would report $Q(A_h)$. If the collusion is not detected, the manager's utility with shirking and collusion is:

$$U_m = S_h - B_k - \rho A_o \geq \mu. \quad (4)$$

¹⁶ The collusion set G is the set of admissible collusion contracts. When G is null, no collusion contract is admissible between auditors and managers. Then the transaction is collusion-free.

If the collusion is detected, the manager's choice of A_o would be ascertained, and he would be fired and sued for damages. As discussed in the last section, the court-determined damages are fixed at η_m and the manager's other income after dismissal is normalized to zero. Figure 1 illustrates the time-line of events within a period and highlights the interactions among the three players in our model.

A dynamic program is used to solve the model. We assume that the same B_k is asked for by the auditor in all periods after the first. Let q_t represent the expected present value of the manager's employment contract at the beginning of any period in which he has not been dismissed. Then, in each period after the first, the manager chooses between honest hard work, with the expected present value of the employment contract to be $\mu + r q_t$, and taking opportunistic action (shirking and collusion), with the expected present value of the employment contract to be $(1 - \pi_k)(U_m + r q_t) + \pi_k(-\eta_m)$. When the manager's effort is costly to observe, the value of the manager's employment contract is:

$$q_t = \max\{\mu + r q_t, (1 - \pi_k)(U_m + r q_t) + \pi_k(-\eta_m)\}.$$

Let $\bar{B}_k$ be the maximum side payment the manager is willing to pay in any period after the first, and let $\bar{q}_t$ be the corresponding expected present value of the manager's employment contract; we then have the boundary condition:

$$\bar{q}_t = \mu + r \bar{q}_t = (1 - \pi_k)(U_m + r \bar{q}_t) + \pi_k(-\eta_m). \quad (5)$$

The first equality in equation (5) indicates that $\bar{q}_t = \mu/(1 - r) = q_t$. Under the maximum side payment, the whole benefit of collusion goes to the auditor; the expected present value of the manager's employment contract with collusion is the same as that with honest hard work. Solving equations (4) and (5), together with $S_h - S_o = \rho$, we get the maximum value of the side payment.

$$\bar{B}_k = \rho - \frac{\pi_k}{1 - \pi_k} \left(\frac{\mu}{1 - r} + \eta_m \right). \quad (6)$$

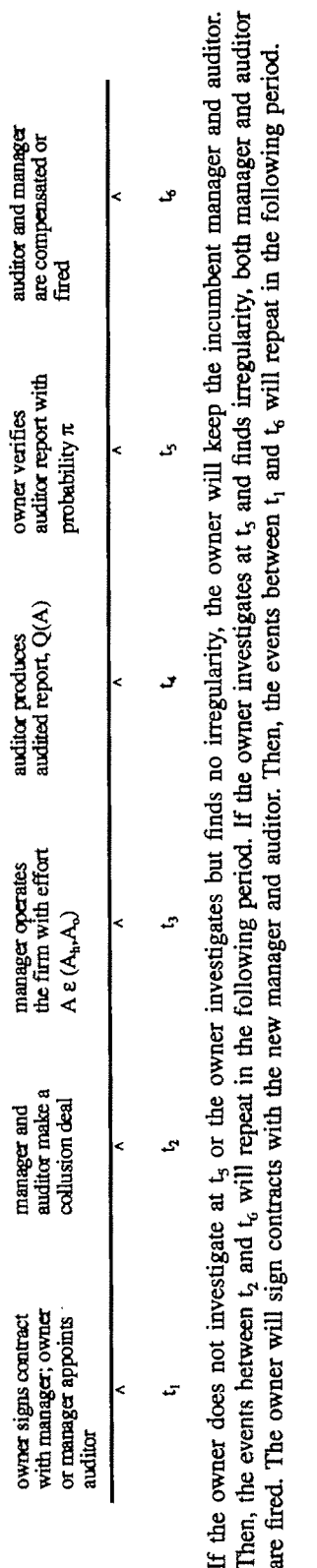
Equation (6) gives an intuitive result. $\mu/(1 - r)$ is the present value of the manager's contract if he keeps the job, and η_m is the one-time legal punishment. If he is ever caught for having colluded, he will forfeit the benefits from keeping the job and will bear the additional legal liability. Thus, $\mu/(1 - r) + \eta_m$ is the total cost of collusion if he is caught. Considering the probability of being caught, the gain he gets from collusion is the value of shirking (ρ) net of the expected punishment. This is the maximum side payment he is willing to offer for collusion.

The analysis for the first period is similar. The expected present value of the manager's employment contract at the beginning of the first period is then:

$$q_1 = \max\{\mu + r q_1, (1 - \pi_1)(U_{m,1} + r q_1) + \pi_1(-\eta_m)\},$$

where subscript 1 indicates the first period. Let $\bar{B}_1$ be the maximum side payment the manager is willing to pay in the first period, and let $\bar{q}_1$ be the corresponding contract value to the manager. Then, $\bar{q}_1 = \mu + r \bar{q}_1 = (1 - \pi_1)(U_{m,1} + r \bar{q}_1) + \pi_1(-\eta_m)$. Comparison with equation (5) shows that $\bar{q}_1 = q_t = q_1$. From these:

FIGURE 1
Time Line of Events in Each Period



$$\bar{B}_1 = \rho - \frac{\pi_1}{1 - \pi_1} \left(\frac{\mu}{1 - r} + \eta_m \right).$$

The only difference between $\bar{B}_1$ and $\bar{B}_k$ is the different probabilities of collusion being detected in the first and other periods.

The Minimum Side Payment the Auditor Is Willing to Accept

In periods after the first, if the auditor rejects the manager's offer of side payment B_k and faithfully follows the Generally Accepted Auditing Standards (GAAS), her income for the period will be fee H . If she accepts the side payment and violates GAAS, she will face dismissal and legal liability with probability π_k . If collusion is detected, she will have to pay a court-determined damage of η_a , and her other income is normalized to zero for that period and thereafter. If the collusion is not discovered, her income for the period would be $H + B_k$, and she can keep her job as well.

Let $\bar{v}$ represent the expected present value of the auditor's contract at the beginning of a period after the first, in which she has not been dismissed. Then:

$$\bar{v} = \max\{H + r\bar{v}, (1 - \pi_k)(H + B_k + r\bar{v}) + \pi_k(-\eta_a)\}.$$

Let $\underline{B}_k$ be the minimum post-first-period side payment the auditor is willing to accept and $\underline{v}$ be the corresponding contract value to the auditor. Then, $\underline{v} = H + r\underline{v} = (1 - \pi_k)(H + \underline{B}_k + r\underline{v}) + \pi_k(-\eta_a)$, and:

$$\underline{B}_k = \frac{\pi_k}{1 - \pi_k} \left(\frac{H}{1 - r} + \eta_a \right). \quad (7)$$

Equation (7), like equation (6), can be intuitively understood. $H/(1 - r)$ is the present value of the audit contracts if the auditor is allowed to keep the job in periods after the first. If she is ever found to have colluded, she will forfeit this amount and, in addition, bear the one-time legal liability η_a . Thus, $\underline{B}_k$ is the auditor's expected income loss from collusion and is the minimum side payment she will ask for compensation.

We can state the auditor's first-period objective function as: $\max\{L + r\bar{v}, (1 - \pi_1)(L + B_1 + r\bar{v}) + \pi_1(-\eta_a)\}$. However, since $L + r\bar{v} = L + rH/(1 - r) = R$, this problem is equivalent to: $\max\{R, (1 - \pi_1)(R + B_1) + \pi_1(-\eta_a)\}$. The minimally acceptable first-period side payment, $\underline{B}_1$, is derived from setting $R = (1 - \pi_1)(R + \underline{B}_1) + \pi_1(-\eta_a)$. Hence:

$$\underline{B}_1 = \frac{\pi_1}{1 - \pi_1} (R + \eta_a).$$

$\underline{B}_1$ differs from $\underline{B}_k$ in the different probability of collusion being detected (π_1) and the total present value of the audit contracts (R) standing in the first period.

Conditions for Collusion-Free Audit Contract

Equation (7) indicates that $\underline{B}_k$ is an increasing function of H and π_k , and equation (6) indicates that $\underline{B}_k$ is a decreasing function of π_k . Hence, collusion can be eliminated by increasing the monitoring intensity π_k , or by increasing the post-first-period audit fee H (correspondingly reducing the first period audit fee L), or both. More specifically, setting

$\underline{B}_k \geq \bar{B}_k$ so that G is null and solving for π_k and H , we obtain a mix of low balling and monitoring intensity for attaining collusion-free audit contracts.

Proposition 1a: In periods after the first, for a given auditing fee structure H , the monitoring intensity π_k can assure auditor independence if:

$$\pi_k \geq \pi_k^* \equiv \frac{\rho}{\rho + \eta_m + \eta_a + \frac{H}{1-r} + \frac{\mu}{1-r}}; \quad (8)$$

or, equivalently, for a given monitoring intensity π_k , the auditing fee structure H can assure auditor independence if:

$$H \geq H^* \equiv (1-r) \left(\frac{1-\pi_k}{\pi_k} \rho - \frac{\mu}{1-r} - \eta_m - \eta_a \right), \quad (9)$$

where the superscript $*$ indicates the critical value for attaining auditor independence.

According to relation (8), π_k^* is the lower bound for an effective monitoring effort. When the monitoring intensity is at this level or higher, it is not worthwhile for agents to shirk and collude; monitoring becomes effective. Rewriting relation (9) slightly differently as $\{(\pi_k/(1-\pi_k))(H/(1-r)) \geq \rho - (\pi_k/(1-\pi_k))(\mu/(1-r) + \eta_m) - (\pi_k/(1-\pi_k))\eta_a\}$ facilitates an intuitive interpretation: the audit fee is set so that the manager's expected net benefits of shirking and colluding, after covering the auditor's expected legal liability, are not enough to cover the auditor's expected fee loss.

One can easily see that the required investigation intensity π_k^* increases as the manager's propensity to shirk ρ gets higher, and as the time preference r , the legal liabilities η_m and η_a , the auditor's future fee H , and the manager's future earnings μ get lower. The manager's propensity to shirk, the time preference and the legal system are beyond the agents' control. However, the auditor's future fee and the manager's future income can be easily adjusted. Fee and compensation structures are observable and are costless to design and to implement. In reality, shirking and collusion are difficult to discover and, when discovered, difficult to prove in court. The cost of investigating and pursuing legal liability is high. The design of the fee and compensation structure is an economic way of reducing the necessary investigation and legal costs associated with corporate contracting. The feature of low balling in an audit contract is a natural outcome of this efficient contract design.

The corresponding result for the first period is:

Proposition 1b: If the audit contract can assure auditor independence in all periods after the first, and if

$$\pi_1 \geq \pi_1^* \equiv \frac{\rho}{\rho + \eta_m + \eta_a + R + \frac{\mu}{1-r}}, \quad (10)$$

then the owner can assure auditor independence in the first period. Moreover, $L^* < F = (1-r)R < H^*$ and $\pi_1^* > \pi_k^*$.

Relation (10) shows that the value of L has no effect on the required investigation intensity in the first period. Standing in the first period, the present value of the audit contract is constant (R) regardless of the fee scheme in effect. Relation (9) indicates that a higher level of H can reduce the required investigation intensity after the first period. These facts together with equation (3) imply $L^* < F = (1 - r)R < H^*$. Hence, Scheme 2 is indeed a low-balling scheme.¹⁷ Under this scheme, the auditor defers amount $F - L$ of compensation relative to the flat-fee scheme and spreads it over all future periods. By doing this, the auditor effectively sets aside a bail bond. If she is later found to have colluded, she will forfeit these deferred payments and will not even be able to recoup her reservation compensation. Comparison of relations (8) and (10) indicates that the required monitoring effort in the first period is higher than those in other periods because the auditor's fee structure cannot help mitigate moral hazard in the first period.

Since the flat-fee scheme is a special case of the low-balling scheme, we easily obtain the required investigation intensity (π_f^*) for attaining the collusion-free contract under this scheme. Since $F = (1 - r)R$, relations (8) and (10) suggest that π_f^* is constant for all periods and equal to π_1^* .

$$\pi_f \geq \pi_f^* = \pi_1^* = \frac{\rho}{\rho + \eta_m + \eta_a + R + \frac{\mu}{1 - r}}. \quad (11)$$

Since $\pi_f^* = \pi_1^*$, there is no difference in the required monitoring level between the low-balling and flat-fee schemes in the first period. Starting from the second period, the required investigation intensity for attaining auditor independence under the flat-fee scheme is higher than that under the low-balling scheme.

Desirability of the Low-Balling Scheme

Our results so far enable us to formalize the intuition that *low balling is a low-cost mechanism to strengthen auditor independence*. The owner has to incur cost C for each investigation. Relation (8) shows that a higher level of H can save such monitoring costs after the first period by reducing the required investigation intensity. We can easily calculate the owner's savings from using low balling and can show that such savings are increasing in H . Although there is no difference in the first period under the two schemes ($\pi_f^* = \pi_1^*$), relations (8) and (11) indicate that in every period after the first, the low-balling scheme can save $C(\pi_f^* - \pi_k^*)$. The present value of the savings in monitoring costs (MCS) under the low-balling scheme is:

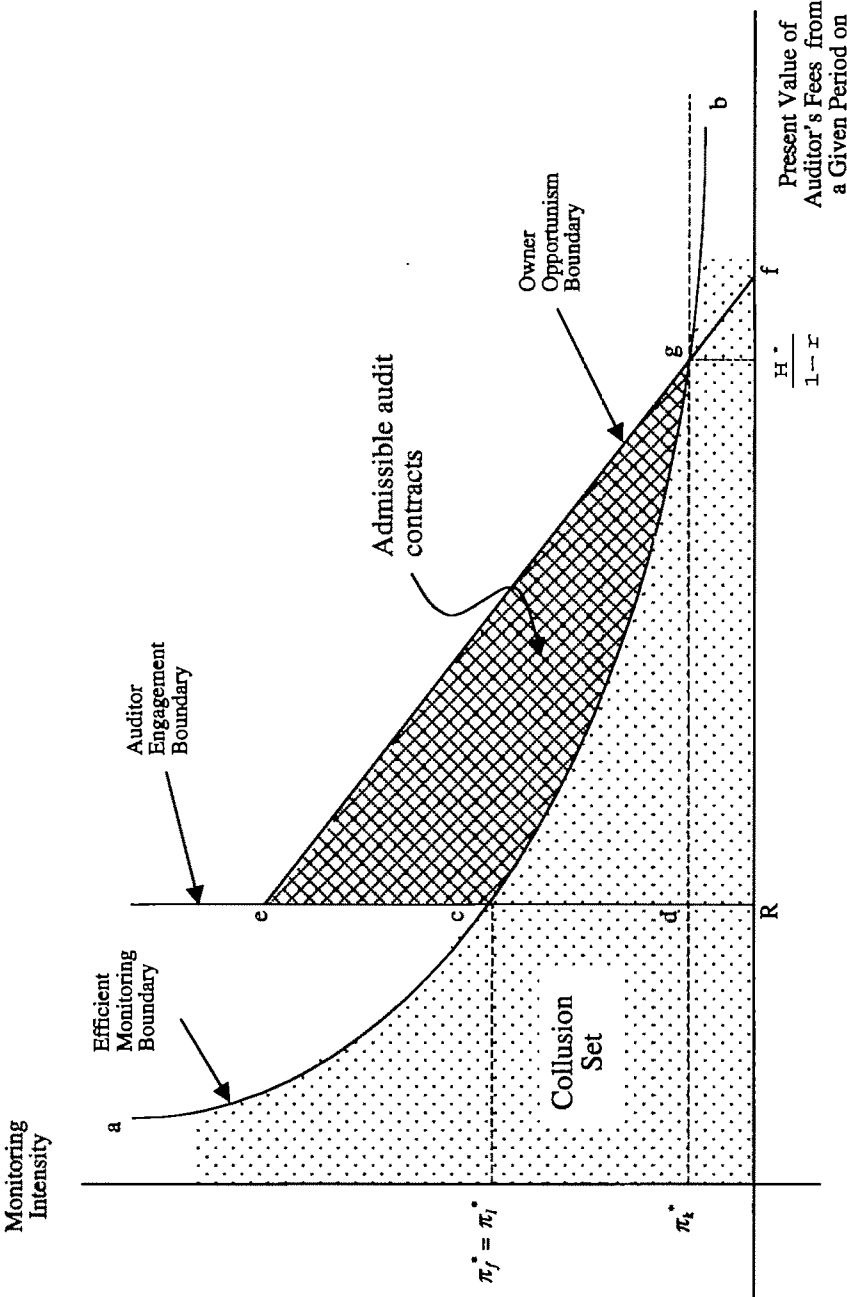
$$MCS = C(\pi_f^* - \pi_k^*) \frac{r}{1 - r}. \quad (12)$$

From equations (3), (8), (11) and (12), we can see that the savings in monitoring costs are an increasing function of the low-balling "spread" $D = H - L$. The larger the spread in the low-balling scheme is, the lower the monitoring costs will be.

We can use figure 2 to illustrate the intuition of our analysis. The horizontal axis measures the present value of the auditor's fees from a given period on. Under the low-balling scheme, the present value is R from the first period on, and $H/(1 - r)$ from the

¹⁷ H is positive, but L can be either positive or negative. $L < 0$ would mean below-cost low balling; this situation will be considered in more depth in section VI.

FIGURE 2
Optimal Low-Balling Fee Scheme and Investigation Intensity



For a flat-fee contract, the effective monitoring boundary and the auditor engagement boundary jointly determine the optimal investigation intensity at point c. For a low-balling contract, the effective monitoring boundary, the auditor engagement boundary, and the owner-opportunism boundary jointly determine the set of admissible contracts. The owner would choose the minimum investigation intensity in this set at point g in periods after the first. The optimal low-balling spread is indicated by the distance dg.

second or a later period on. Under the flat-fee scheme, the present value is always R from any period on. The vertical axis measures the corresponding monitoring intensity. The combinations of monitoring intensity and fee structure that *just* attain auditor independence in periods after the first are described by $\bar{B}_k = \underline{B}_k$, the locus of which is the hyperbolic ab curve; we refer to this curve as the effective monitoring boundary. The region above ab contains all points $(H/(1-r), \pi)$ for which the collusion set G is null, and the region below ab contains points in the collusion set. Since investigation is costly, the owner would prefer a design as close to the ab curve and with as small an investigation intensity as possible.

The line ecdR is the auditor engagement boundary, which sets the minimum audit fee. Under the flat-fee scheme, the minimum auditor's fee to engage the auditor is R for every period. The intersection of this boundary and the effective monitoring boundary curve ab determine the optimal investigation intensity π_f^* for all periods. Under the low-balling scheme, irrespective of the low-balling spread, the first-period present value of the auditor's fee is always R . Hence the required investigation intensity in the first period is always π_1^* , which is equal to π_f^* . To reduce monitoring cost, the owner prefers a lower post-first-period investigation intensity along the effective monitoring boundary by increasing the low-balling spread. Hence, low balling is a cost-saving monitoring design.

We can use an extreme case, $\eta_m = \eta_a = R = \mu = 0$, to illustrate the desirability of the low-balling scheme. When the manager's legal liability (η_m) and market wage (μ) are zero, there is no postmortem leverage against the manager's shirking behavior. When the auditor's legal liabilities (η_a) and market value (R) are zero, there is no postmortem leverage against the auditor's false reporting under the flat fee scheme. Therefore, by equation (11) we have $\pi_f^* = 1$; the owner has no choice but to undertake the entire investigation herself in every period. Yet with low balling, a form of punishment is effectively "created" by setting a higher future fee ($H/(1-r) > 0$), and thereby making it preferable for the owner to delegate verification to the auditor and to reduce her monitoring cost. By relation (8), we can see that the post-first-period investigation intensity π_k^* is less than one. According to equation (12), the reduction of monitoring cost by the low-balling scheme is $C(1 - \pi_k^*)r/(1-r)$. Note that with $R = 0$, the optimal fee scheme would be below-cost low balling ($L < 0$).

V. OWNER OPPORTUNISM AND ADMISSIBLE AUDIT CONTRACTS

The owner is as much a rational rent-seeking economic agent as the manager and the auditor are. We need to consider the issue of double moral hazard related to the audit contract.¹⁸ If the first-period audit fee L is set "too low" and the post-first-period audit fee H "too high," the opportunistic owner may fire the auditor after one period and then hire another one in an attempt to receive a low ball again. Of course, such a contract would not be proposed by a rational auditor in the first place. An *admissible* low-balling contract must preclude such owner opportunism, with H suitably bounded from above and L from below.

The monetary incentive for the owner's opportunistic contract termination is "the incumbent auditor's quasi-rents," $H - L$. According to equation (3), these quasi-rents can also be stated as $H/(1-r) - R$. The cost of the opportunistic contract termination includes three items: (1) the cost of extra investigation associated with a new auditor, $(\pi_1^* - \pi_k^*)C$; (2) other transaction cost related to auditor switching, τ ; and (3) punishment for opportunistic contract termination, ω . The first item can be viewed as a part of the owner's start-up

¹⁸ Double moral hazard is the event in which the economic agents on both sides of the contract transaction are opportunistic. Early studies on this issue include Cooper and Ross (1985) and Demski and Sappington (1991).

cost for hiring a new auditor. The second item includes the auditor's start-up cost for a new audit engagement and all other transaction costs related to the auditor change. The sum of the first two items is the total transaction cost of the auditor switch. The third item includes reputation costs, breach damages, potential law suits, and leak of proprietary information by the dismissed auditor. Since most audited firms are medium-sized to large companies listed on stock exchanges, the reputation cost can be rather substantial; ω can be large.

An admissible audit contract must also ensure that the dismissal threat in the contract is credible. That is, given audit failure, the owner *does* have the incentive to dismiss the auditor. The benefits of dismissal stem from two sources: (1) seizing of the incumbent auditor's quasi-rents; and (2) serving as a punishing mechanism so that audit failure is not repeated and higher effort is exerted from the (new) manager in the future. Inequality (2) in the text sets the minimum condition for the benefit of this punishing mechanism. When inequality (2) is violated, we have the trivial equilibrium with low managerial effort and no monitoring. The lower bound for quasi-rents (low-balling spread) is zero, which means the flat-fee scheme is in the set of admissible contracts. Given auditor independence, the owner has no incentive to terminate a low-balling contract if the incumbent auditor's quasi-rents are no larger than the total cost of opportunistic contract termination. More formally:

$$0 \leq \frac{H}{1-r} - R \leq (\pi_1^* - \pi_k^*)C + \tau + \omega. \quad (13)$$

We can use figure 2 to illustrate the admissible audit contract and the determination of an optimal low-balling scheme. The hyperbola *ab* derived from relation (8) (or equivalently, relation (9)) describes the boundary of effective monitoring designs. The line *egf*, which is derived from relation (13), describes the boundary of the elimination of owner opportunism. The line *ecdR* is the boundary for auditor engagement. The cross-hatched region within these three boundaries is the set of admissible audit contracts. Since changing the low-balling spread is costless and changing the investigation intensity is costly, the least costly monitoring design is determined at point *g*. The distance *dg* is the optimal low-balling spread.

So far, we assume that the low balling takes place in the first period. We can show that a contract with low balling in more than one period can result in higher investigation intensity by the owner. The intuition can be understood from relations (8) and (10). A low ball has no effect on the required investigation intensity in the period of low balling. Its effect on reducing the monitoring cost starts only in subsequent periods. If there are two periods of low balling, one can move the second low ball to the first period and start the cost savings from the second period onward rather than waiting for the second low ball to take effect later on. Similar arguments can be given to more than two periods of low balling. In short, low balling in more than one period requires extra monitoring effort in the second and/or later low balling periods. Hence, one-period low balling is an efficient contract design. We can state the efficient time profile of the low-balling scheme in Corollary 1.

Corollary 1: In a multi-period audit contract, low balling takes place only in the first period.

VI. COMPARATIVE STATICS

Low-Balling Spread

The optimal fee structure in the audit contract can be characterized by its corresponding low-balling spread $D = H^* - L^*$. Comparative static analysis of relations (8) and (13) leads to insights about our monitoring design. We summarize the results in the following proposition.

Proposition 2: The optimal amount of low balling for maintaining auditor independence increases as the transaction cost of auditor change τ , the punishment for the owner's opportunistic contract termination ω , and the owner's investigation cost C increase; it decreases as the auditor and the manager's discount factor r , the auditor's market value R , the manager's market value μ , and the legal liabilities η_m and η_a increase. That is, $\partial D / \partial \tau > 0$, $\partial D / \partial \omega > 0$, $\partial D / \partial C > 0$, $\partial D / \partial r < 0$, $\partial D / \partial R < 0$, $\partial D / \partial \mu < 0$, $\partial D / \partial \eta_m < 0$, $\partial D / \partial \eta_a < 0$.

The first four results can be easily demonstrated in figure 2. If the transaction cost of auditor change τ or the punishment for owner opportunism ω is higher, the owner will be less likely to dismiss the incumbent auditor in the future, so that the latter can agree to a larger low-balling spread. In figure 2, an increase in τ and ω will shift the owner opportunism boundary line egf rightward, leading to a larger admissible audit contract set and a higher optimal low-balling spread $H^* - L^*$ (distance dg). The investigation cost result can be explained by the fact that if the owner dismisses the incumbent auditor, the total monitoring cost from that point on will be higher because the first period under a new contract requires higher investigation intensity, $\pi_1^* > \pi_k^*$. Thus, a higher investigation cost C makes the owner opportunism more costly. In figure 2, an increase in C will make the owner opportunism boundary line egf flatter, hence, a higher optimal low-balling spread. If the auditor or the manager has a higher time preference, a smaller weight (discount factor r) will be placed on future income by the auditor. Then, the punishment for audit failure will be smaller. To maintain the same level of auditor independence, the low-balling spread has to be increased.

Since the first-period-required investigation intensity depends on the auditor's market value R irrespective of the fee scheme, an increase in R will raise the cost of audit failure and discourage collusion in the first period. This discouragement of first period collusion also implies that the owner's start-up cost on a new audit contract will be lower and that owner opportunism will be less costly. Therefore, a higher auditor's market value will mitigate the auditor's moral hazard but heighten the owner's moral hazard. The auditor will trust less in the low-balling contract, so that the optimal low-balling spread will be reduced. Similarly, a higher manager's market value μ will mitigate the manager's moral hazard but heighten the owner's moral hazard, so that the optimal low-balling spread will be smaller. In figure 2, as the auditor's market value R increases, the auditor engagement boundary line $ecdR$ shifts rightward, also pushing the owner opportunism boundary egf rightward. However, since π_1^* decreases due to the increase in R , the rightward shift of egf is offset by the changes in π_1^*C (relation (13)). Then, the low-balling spread dg becomes smaller.

If the auditor's and the manager's legal liabilities (η_a and η_m , respectively) are higher, then the legal system can deter collusion better. The low-balling spread should be reduced. Interpreted slightly differently, as η_a and η_m become higher, the required monitoring intensity in all periods will be lower. The moral hazard of both the auditor and the manager will be mitigated while owner opportunism will be more severe; a lower low-balling spread

is obtained. From the viewpoint of efficient monitoring, low balling can supplement the legal process as a means for maintaining auditor independence at a much reduced cost.

Below-Cost Low Balling

We now examine whether low balling is below cost, i.e., whether $L < 0$ in our model. The answer to this question is quite immaterial from the standpoint of preventing auditor-manager collusion. However, when low balling is below cost, implications for market competition may arise as well. Regulatory agencies may worry that accounting firms with "deep pockets" may give such low balls that they bar less resourceful firms from competition. We provide the conditions for below-cost low balling in Proposition 3.

Proposition 3: Under the conditions assumed in the paper, below-cost low balling will occur if:

- i) the auditor's market value R is sufficiently low; or
- ii) the manager's market value μ is sufficiently low; or
- iii) the legal liability η_m or η_a is sufficiently low; or
- iv) the owner's cost for replacing auditor τ is sufficiently high; or
- v) the punishment for the owner opportunism ω is sufficiently high; or
- vi) the cost of investigation C is sufficiently high; or
- vii) the first-period auditing cost is sufficiently higher than the future-period auditing cost.

The derivation of below-cost low balling in DeAngelo (1981), Dye (1991) and Kanodia and Mukherji (1994) can be viewed as a special case of Proposition 3. DeAngelo (1981) set auditor's market value R to be the competitive market fee and showed that conditions (iv) and (vii) lead to below-cost low balling. Dye (1991) argued that the unobservability of auditor's market value R (hence the quasi-rents) is a crucial condition for a noisy rational expectation equilibrium. Kanodia and Mukherji (1994) argued that the incumbent auditor's informational advantage is an important consideration in the owner's assessment of R and τ . We show that conditions (ii), (iii), (v) and (vi) are additional economic factors that can lead to below-cost low balling.

Causey (1979, 185–186) discussed the anti-competitive, predatory potential of low balling. Our analysis suggests a different view. An auditor might not survive if she cannot, for liquidity or other reasons, give a low ball to the extent that the first-period return is negative under certain circumstances. Employing such an auditor, the owner would have to incur a higher monitoring cost stemming from the need to raise the monitoring level. As a result, these auditors would not win contracts from the owners. *Such market exclusion may have merit, especially from the perspective of contracting/monitoring efficiency.*

VII. CONCLUSIONS

The SEC and the *Cohen Report* argue that low balling jeopardizes auditor independence, while we demonstrate that low balling can enhance auditor independence. The key difference between their argument and this paper on low balling and auditor independence is who possesses the right to fire and hire the auditor. Low balling can enhance auditor independence when the owner holds the right, or can jeopardize independence when the manager holds the right. We believe reality lies somewhere in between these extremes: the owners or their representatives are actively involved and the managers also have limited

power to hire and fire the auditors.¹⁹ As long as the owners have some influence over the hiring and firing of the auditors, low balling can enhance the efficiency of the monitoring process.

In summary, we have constructed a model in which the market for external auditing services has a mechanism—the low-balling scheme—for attaining auditor independence at low costs. With such a scheme, the auditor in effect puts up a bail bond with the owner, to be forfeited if wrongdoing is discovered. The low-balling fee structure can reduce the owner's investigation intensity and supplement legal actions and court procedures to eliminate the manager-auditor collusion at lower costs than a flat-fee structure. The negative attitude toward low balling, posed by the *Cohen Report* and by the SEC and other regulating authorities, may be unwarranted. Actions restricting low balling in the market for external auditing services may lead to inefficiency. The recent surge in shareholder activism renders this conclusion increasingly relevant and significant.

APPENDIX

Mathematical Proofs

Proof of Corollary 1

Let L' , L' , H' ... be the optimal audit fee structure in the low-balling scheme with two identical initial low-balling periods (i.e., $L' + rL' + (r^2H'/1 - r) = R$, with $L' < H'$). Let $\phi_1, \phi_2, \phi_k, \phi_k, \dots$ be the owner's monitoring costs under this scheme. We want to show that the monitoring costs with two-period low balling are higher than those with one-period low balling.

By working backwards, it follows that the H^* in all periods after the second is the same under this scheme as that derived earlier for the one-period low-balling scheme; and that, as an immediate consequence, $\phi_k = \pi_k^*C$, with π_k^* given by equation (8). For the second period, $\phi_2 = \pi_2^*C$, where:

$$\pi_2^* = \frac{\rho}{\rho + \eta_m + \eta_a + L' + \frac{rH'}{1-r} + \frac{\mu}{1-r}}.$$

Now, $L' < H'$ implies $R < L' + (rH'/1 - r) < H'/1 - r$, so that $\pi_1^* > \pi_2^* > \pi_k^*$. It follows from exactly the same algebraic steps leading to equation (10) that for the first period, $\phi_1 = \pi_1^*C$. Therefore, we have $\phi_1 > \phi_2 > \phi_k$. As is shown in Proposition 1, under the one-period low balling, the monitoring costs are $\phi_1, \phi_k, \phi_k, \dots$. Hence, monitoring costs are higher with two-period low balling than those with one-period low balling. The conclusion is the same if the two low balls in the first two periods are different.

QED

¹⁹ Since the manager has better knowledge about the auditor's competence and the nature of the audit engagement, he may be delegated with certain power to fire the auditor. Precisely because of the potential collusion and managerial power abuse, the manager has never had the full power to fire the auditor, and the final authority rests with the owner. In addition to the increasing role played by audit committees in audit issues discussed in section II, an auditor wrongly dismissed by the manager has ways to expose the managerial abuse. The AICPA (1975) also provides mechanisms to protect its members from unscrupulous managers. For example, a newly engaged auditor is *required* by SAS No. 7 (AU 315) to communicate with the predecessor auditor with the sole purpose of helping the successor auditor evaluate whether to accept the engagement. Such communication can disclose wrongful dismissals due to the client's lack of integrity.

Proof of Proposition 2

The optimal low-balling spread D and optimal reduction in investigation intensity δ are derived from the following two equations.

$$D \equiv \frac{H^*}{1-r} - R = \tau + \omega + \delta C \quad (14)$$

$$\begin{aligned} \delta &\equiv \pi_1^* - \pi_k^* \\ &= \frac{\rho}{\rho + \eta_m + \eta_a + R + \frac{\mu}{1-r}} - \frac{\rho}{\rho + \eta_m + \eta_a + R + \tau + \omega + \delta C + \frac{\mu}{1-r}}. \end{aligned} \quad (15)$$

Equation (14) is the boundary solution from the second inequality in relation (13). Equation (15) is a reduced form of relations (8), (10) and (14).

From equations (14) and (15), it is obvious that:

$$\begin{aligned} \frac{\partial \delta}{\partial \tau} &> 0, & \frac{\partial D}{\partial \tau} &> 0; \\ \frac{\partial \delta}{\partial \omega} &> 0, & \frac{\partial D}{\partial \omega} &> 0; \\ \frac{\partial \delta}{\partial C} &> 0, & \frac{\partial D}{\partial C} &> 0; \end{aligned}$$

To sign $\partial D / \partial R$ in Proposition 2, we must first sign the corresponding partial derivatives of δ . Differentiating δ implicitly with respect to R and rearranging, one gets:

$$\begin{aligned} \frac{\partial \delta}{\partial R} &= \left[1 - \frac{\rho C}{\left[\rho + \eta_m + \eta_a + R + \tau + \omega + \delta C + \frac{\mu}{1-r} \right]^2} \right]^{-1} \\ &\times \left[\frac{\rho}{\left[\rho + \eta_m + \eta_a + R + \tau + \omega + \delta C + \frac{\mu}{1-r} \right]^2} \right. \\ &\quad \left. - \frac{\rho}{\left[\rho + \eta_m + \eta_a + R + \frac{\mu}{1-r} \right]^2} \right] < 0. \end{aligned}$$

Comparing the above equation with equation (14), we can see $\partial D / \partial R < 0$. Similarly, we can show $\partial \delta / \partial \mu < 0$ and $\partial D / \partial \mu < 0$, $\partial \delta / \partial \eta_m < 0$ and $\partial D / \partial \eta_m < 0$, $\partial \delta / \partial \eta_a < 0$ and $\partial D / \partial \eta_a < 0$, $\partial \delta / \partial r < 0$ and $\partial D / \partial r < 0$.

QED

Proof of Proposition 3

Based on equation (3) and $D \equiv H - L$, we have $L = (1-r)R - rD$. Hence, we can apply Proposition 2 to get following results.

$$\frac{\partial L}{\partial R} = (1 - r) - r \frac{\partial D}{\partial R} > 0;$$

$$\frac{\partial L}{\partial \mu} = -r \frac{\partial D}{\partial \mu} > 0;$$

$$\frac{\partial L}{\partial \eta_m} = -r \frac{\partial D}{\partial \eta_m} > 0;$$

$$\frac{\partial L}{\partial \eta_a} = -r \frac{\partial D}{\partial \eta_a} > 0;$$

$$\frac{\partial L}{\partial \tau} = -r \frac{\partial D}{\partial \tau} < 0;$$

$$\frac{\partial L}{\partial \omega} = -r \frac{\partial D}{\partial \omega} < 0;$$

$$\frac{\partial L}{\partial C} = -r \frac{\partial D}{\partial C} < 0.$$

For a constant periodical auditing cost, we get Proposition 3.

QED

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Corporate Hierarchy and Goal Attainability

Michael S. H. Shih

National University of Singapore and University of Toronto

ABSTRACT: The performance goal for a unit is commonly created by consolidating the goals of its subunits. This paper shows that if it is *difficult* (easy) for the subunits to achieve their goals, it is almost always even *more difficult* (easier) for the unit to achieve the consolidated goal. This means, for example, that the firm as a whole will almost certainly not meet a goal to cut its costs by a certain percentage if the degree of cost cutting is difficult to achieve at the individual subunit levels.

Key Words: *Goal attainability, Performance evaluation, Corporate hierarchy, Budget reserves.*

I. INTRODUCTION

A corporate hierarchy arises when related units are grouped together—work cells form departments, departments form plants, plants form divisions and divisions form business groups. Accounting texts (e.g., Hilton 1997, 585; Garrison and Noreen 1997, 364) suggest that some firms create high level, consolidated budget performance goals by merging the budgeted goals of the lower level units. The issue addressed in this paper is the relation between the attainability of subunit and consolidated goals in such settings.

The analysis presented in this paper shows that the attainability of the consolidated goal often differs dramatically from that of the subunit goals. If the subunit goals are all difficult (easy) to attain, it is almost always the case that the consolidated goal is even harder (easier) to attain. The analysis also reveals that the correlation of the performances of the subunits impacts the attainability of the consolidated goal in a predictable fashion. In particular, the higher the correlation of the subunit performances the more the attainability of the consolidated goal approaches the attainability of the subunit goals.

These results of the paper have implications for settings in which consolidated performance goals are derived from a simple aggregation of subunit goals. For example, the

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results suggest that *Kaizen* costing¹—establishing a cost savings goal equal to a certain percentage of the prior period's costs for all units—is likely to have little chance of success at the consolidated level if the subunit goals are difficult to meet. Furthermore, the results of this study suggest that budgeting for higher level units within an organization is likely to be more complicated than a simple aggregation of lower level performance budgets. In particular, the process of determining the performance budgets of units at higher organizational levels is likely to include formal and informal devices (e.g., budget reserves) so that the resulting consolidated goal has an appropriate chance of being attained.

The rest of the paper is as follows. Sections II and III present the analytical results. Section IV presents the conclusions.

II. THEORY

The issue of concern is the relation between the attainability of budget goals at the subunit and consolidated levels. The aggregation issues involved are the same whether goals are for revenue, costs, or profit. However, in order to keep the analysis clear, the model presented in this section is explained from the perspective of the attainability of budget objectives for costs. The appendix to this paper outlines how the model applies to the aggregation of revenue budgets and to the aggregation of revenue and cost budgets into a consolidated profit budget.

Consider a firm that has units at various levels of the corporate hierarchy. The responsibilities of the manager of the consolidated group g include planning, coordinating the activities of the subunits, supervising a staff that renders services to the subunits (the costs of the services are fully charged to the subunits) and evaluating the performance of the managers of the subunits. Let the consolidated group g be composed of two subunits, unit a and unit b .

The firm adopts a *Kaizen* system to continuously improve its cost competitiveness. *With production facilities already in place*, units at all levels of the corporate hierarchy are each required to improve efficiency to generate y percent cost savings each year relative to the year before. That is, given the volume of output each unit plans to produce in any year t , it is assigned a cost goal (not to be exceeded) equal to $(1 - y\%)$ times what the actual cost in year $t - 1$ would have been at the production volume planned for year t . Assume that at their respective production volumes planned for year t , units a and b would have incurred direct costs of δ_a and δ_b respectively in year $t - 1$, and incurred indirect costs of λ_a and λ_b respectively in year $t - 1$ for using services provided by the group g head-office. Then, units a and b 's cost goals under the *Kaizen* system for year t are $\Gamma_a = (1 - y\%)(\delta_a + \lambda_a)$ and $\Gamma_b = (1 - y\%)(\delta_b + \lambda_b)$ respectively. Group g 's cost goal for year t under the system is $\Gamma_g = (1 - y\%)(\delta_a + \delta_b + \lambda_a + \lambda_b) = \Gamma_a + \Gamma_b$.

At the start of year t , the *Kaizen* goals of Γ_a , Γ_b and Γ_g are known.² The chances of these goals being attained depend respectively on the probability distributions of the total costs (including direct and indirect costs) of units a and b , and group g in that year. Let I_a and I_b be the total costs of units a and b in year t respectively, and I_g be the total cost of group g in that year; i.e., $I_g = I_a + I_b$. Let $\text{pr}(\cdot)$ denote the probability function. The chances of units a and b attaining the $y\%$ cost savings in year t then equal $\text{pr}(I_a \leq \Gamma_a)$ and $\text{pr}(I_b \leq \Gamma_b)$ respectively and the chance of group g doing so equals $\text{pr}(I_g \leq \Gamma_g) = \text{pr}(I_a + I_b \leq \Gamma_a + \Gamma_b)$.

¹ Many accounting texts explain and discuss the concept of *Kaizen* costing; see, for example, Atkinson et al. (1997, 618) and Hilton (1997, 265).

² The analysis can be interpreted as assuming that planned and actual production for year t are the same or that the firm uses a flexible budget for assessing cost control performance.

Let σ_a and σ_b be the standard deviations of I_a and I_b respectively. Assume that if the managers of units a and b , the manager of group g and his/her superior managers all put forth good efforts in performing their jobs, the means of I_a and I_b are μ_a and μ_b respectively.

Results are derived assuming that all costs have a symmetric distribution. The formal proofs provided here further assume that the costs of units a and b are bivariate normal, but the same results obtain if the distribution is bivariate uniform. Theorem I deals with cases in which subunit goals are difficult to achieve (less than a 50 percent chance of success) and Corollary I deals with cases in which subunit goals are easy to achieve (greater than a 50 percent chance of success).

Theorem 1: $\text{pr}(I_a + I_b \leq \Gamma_a + \Gamma_b) < \text{pr}(I_a \leq \Gamma_a) = \text{pr}(I_b \leq \Gamma_b)$, if
 (A1) (I_a, I_b) are bivariate normal and imperfectly correlated and
 (A2) $\text{pr}(I_a \leq \Gamma_a) = \text{pr}(I_b \leq \Gamma_b) < 0.5$.

Proof: Given assumption (A2):

$$\text{pr}(I_a \leq \Gamma_a) = \Phi[(\Gamma_a - \mu_a)/\sigma_a] = \text{pr}(I_b \leq \Gamma_b) = \Phi[(\Gamma_b - \mu_b)/\sigma_b] < 0.5. \quad (1)$$

The cumulative density function $\Phi(\cdot)$ is less than 0.5 for negative arguments, so:

$$(\Gamma_a - \mu_a)/\sigma_a = (\Gamma_b - \mu_b)/\sigma_b < 0. \quad (2)$$

Next, note that given two fractions s/t and u/v , if $s/t = u/v$, then $(s + u)/(t + v) = s/t = u/v$. Thus, inequality (2) implies:

$$(\Gamma_a + \Gamma_b - \mu_a - \mu_b)/(\sigma_a + \sigma_b) = (\Gamma_a - \mu_a)/\sigma_a = (\Gamma_b - \mu_b)/\sigma_b < 0. \quad (3)$$

The probability that group g will meet the cost goal $\Gamma_a + \Gamma_b$ is $\Phi[(\Gamma_a + \Gamma_b - \mu_a - \mu_b)/\sigma_g]$. Let the imperfect correlation between I_a and I_b be r_{ab} . The variance of group g 's cost ($I_g = I_a + I_b$) is:

$$\sigma_g^2 = \sigma_a^2 + \sigma_b^2 + 2r_{ab}\sigma_a\sigma_b < (\sigma_a + \sigma_b)^2. \quad (4)$$

The strict inequality in (4) follows from the assumption (A1) that I_a and I_b are imperfectly correlated ($r_{ab} < 1$). Because $\sigma_g < \sigma_a + \sigma_b$ and $(\Gamma_a + \Gamma_b - \mu_a - \mu_b) < 0$, we have:

$$(\Gamma_a + \Gamma_b - \mu_a - \mu_b)/\sigma_g < (\Gamma_a + \Gamma_b - \mu_a - \mu_b)/(\sigma_a + \sigma_b) \quad (5)$$

and

$$\begin{aligned} \text{pr}(I_a + I_b \leq \Gamma_a + \Gamma_b) &= \Phi[(\Gamma_a + \Gamma_b - \mu_a - \mu_b)/\sigma_g] \\ &< \Phi[(\Gamma_a + \Gamma_b - \mu_a - \mu_b)/(\sigma_a + \sigma_b)] \\ &= \Phi[(\Gamma_a - \mu_a)/\sigma_a] = \Phi[(\Gamma_b - \mu_b)/\sigma_b] \\ &= \text{pr}(I_a \leq \Gamma_a) \\ &= \text{pr}(I_b \leq \Gamma_b). \end{aligned} \quad (6)$$

Q.E.D.

Because $(\Gamma_a + \Gamma_b - \mu_a - \mu_b)/\sigma_g$ is negative, it increases with σ_g . σ_g increases with r_{ab} . Thus, the lower the cost correlation r_{ab} , the lower the chance for group g to meet the goal

$\Gamma_a + \Gamma_b$. In the extreme case where $r_{ab} = -1$ and $\sigma_a = \sigma_b$, $\sigma_g = 0$. As $\sigma_g \rightarrow 0$, $(\Gamma_a + \Gamma_b - \mu_a - \mu_b)/\sigma_g \rightarrow -\infty$ and $\text{pr}(I_a + I_b \leq \Gamma_a + \Gamma_b) \rightarrow 0$. So, as $r_{ab} \rightarrow -1$, the probability that group g will achieve the consolidated goal approaches zero.

Corollary 1: $\text{pr}(I_a + I_b \leq \Gamma_a + \Gamma_b) > \text{pr}(I_a \leq \Gamma_a) = \text{pr}(I_b \leq \Gamma_b)$, if
 (1) (I_a, I_b) are bivariate normal and imperfectly correlated and
 (2) $\text{pr}(I_a \leq \Gamma_a) = \text{pr}(I_b \leq \Gamma_b) > 0.5$.

The proof is similar to that for Theorem 1. The result is different because in this case, $(\Gamma_a + \Gamma_b - \mu_a - \mu_b) > 0$, and $(\Gamma_a + \Gamma_b - \mu_a - \mu_b)/\sigma_g$ decreases with σ_g . Given that σ_g increases with r_{ab} , the lower r_{ab} is, the greater the chance that group g will meet its goal $\Gamma_a + \Gamma_b$. As $r_{ab} \rightarrow -1$, $\sigma_g \rightarrow 0$, $(\Gamma_a + \Gamma_b - \mu_a - \mu_b)/\sigma_g \rightarrow \infty$ and $\Phi[(\Gamma_a + \Gamma_b - \mu_a - \mu_b)/\sigma_g] \rightarrow 1$. So in cases where $\sigma_a = \sigma_b$, as $r_{ab} \rightarrow -1$, the probability that group g will achieve the consolidated goal becomes a certainty.

A numerical example will help to highlight the effects studied here. Assume that the subunit costs I_a and I_b are bivariate normal with $\mu_a = \$352$, $\mu_b = \$278$, $\sigma_a = \$200$ and $\sigma_b = \$300$. The subunit budgeted performance goals are $\Gamma_a = \$300$ and $\Gamma_b = \$200$. In this example, both units have a relatively low chance of attaining their respective cost goals.

$$\text{pr}(I_a \leq \Gamma_a) = \Phi[(\Gamma_a - \mu_a)/\sigma_a] = 0.3974,$$

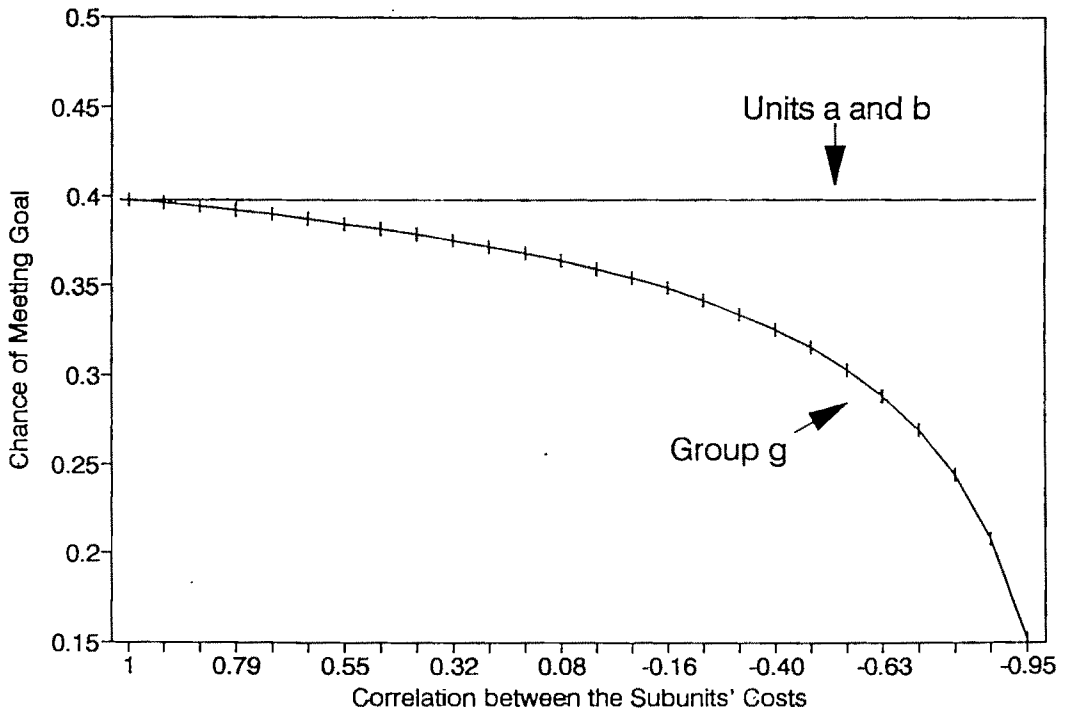
$$\text{pr}(I_b \leq \Gamma_b) = \Phi[(\Gamma_b - \mu_b)/\sigma_b] = 0.3974.$$

For group g to attain its *Kaizen* cost goal, its costs must not exceed $\Gamma_a + \Gamma_b = \$500$. Figure 1 shows the chance of attaining that cost goal at various levels of correlation between the costs of units a and b . Unless the costs of units a and b are perfectly correlated, the probability that group g will attain its cost performance goal is always *less* than the corresponding probability for either subunit. For example, if the costs of units a and b are independent, figure 1 shows that the probability that group g will attain its cost performance goal is about .36 ($< .3974$). Figure 1 reveals that the probability that group g will make its cost goal decreases as the correlation of the subunits' costs decreases.

III. DISCUSSION

Units a and b in the model described in the previous section can be any two units at any level of the corporate hierarchy. Therefore, the results can be applied recursively, first to units at the bottom level and then to those at higher and higher levels. This suggests that *Kaizen* costing has the potential to create a snowball effect. If the chance to attain the y percent cost savings is lower (higher) than 50 percent for units at the bottom-level, then the chance to attain the y percent cost savings will be progressively lower (higher) for units at successively higher levels of the hierarchy. Thus, while imposing the same y percent cost savings target on units at all levels appears to be fair and to treat all managers equally, it can actually be very unfair to managers at different levels in the organization. In extreme cases, the units at top levels and the firm as a whole may have virtually no chance or a 100 percent chance of attaining the cost savings. Neither outcome is desirable. Very high goal attainability is likely to induce little managerial effort (Ronen and Livingstone 1975; Locke et al. 1981; Chow 1983) and lead to poorer performance than is reasonably attainable at higher organizational levels. But very low goal attainability could also lead to poor performance, as managers will not commit to achieving the goals (Erez and Zidon 1984; Locke et al. 1988). Moreover, such low attainability is likely to hurt morale as a result of managers failing to meet the goals repeatedly (Merchant and Manzoni 1989), and may induce managers to engage in a variety of undesirable behaviors. These include (1)

FIGURE 1
Chances of Group *g* and its Subunits Attaining *y*% Cost Savings



taking actions that boost short-term results but damage the firm's long-term viability (Anthony and Govindarajan 1995),³ (2) deceiving superior managers (Collins et al. 1988), and (3) committing outright fraud (Harvard Business School, Case No. 187-066, *Disctech, Inc.*).⁴

Theorem 1 and Corollary 1 give sufficient conditions for their respective results. The stated conditions are not necessary. The *necessary conditions* for group *g* to have a lower (higher) chance of achieving the *y* percent cost savings than its subunits are: (1) group *g*'s cost goal is less (greater) than the mean of its cost, and (2) the costs of the subunits are less than perfectly correlated. Thus, if each subunit's *Kaizen* goal is lower (higher) than the mean of its cost (so that necessary condition (1) is met), group *g*'s chance of meeting its goal will be even lower (higher) than the subunits' chances of meeting their respective goals. I conducted some sensitivity analysis and found that these basic results hold in many cases where the subunits' chances of meeting their goals are not identical and costs are not symmetrically distributed around their means. These results are available upon request.

The model developed in the previous section assumed that group *g* contained only two subunits. Sensitivity analysis (not reported here) indicates that the difference in attainability of the *Kaizen* cost goals between the consolidated unit and the subunits is greater when

³ Examples of such actions can be found in, e.g., Abrams (1981), Baber (1985), Dechow and Sloan (1991), Dafeo et al. (1989), Hand (1989) and Dean (1974).

⁴ There is some prior work that is concerned with an ideal level or range for the attainability of performance goals. Some believe it is below 50 percent (e.g., Chow 1983; Dunbar 1971; Otley 1987, 44; Stedry and Kay 1966), while others believe it is above 50 percent (e.g., Merchant and Manzoni 1989).

there are more subunits in the consolidated group. Numerical examples of this result are also available upon request.

Cost and managerial accounting texts state that firms form the budget of a mid- or high-level unit by merely consolidating the budgets of its subunits (e.g., Hilton 1997, 585; Garrison and Noreen 1997, 364).⁵ The insights from the analysis presented here suggest that the consolidation method of forming budgets is potentially dysfunctional and may result in progressively harder or progressively easier budgets being assigned to units at higher and higher levels of the corporate hierarchy.⁶ Budgeting for mid- and high-level units is therefore unlikely to be as simple as the accounting texts have described. A more plausible scenario is that firms use the consolidated budget merely as the starting point in budget negotiations, and employ various formal or informal devices to adjust the attainability of the final budgets to the desired level. A budget reserve, for example, could be negotiated and added to the final budget.⁷ Consider two units with cost budget goals of u and v , respectively. If consolidating these goals would create a very difficult or very easy goal, the cost budget goal of the unit comprising these units could be set at $u + v$ plus a budget reserve x ; $x > 0$ (< 0) if $u + v$ is deemed too difficult (easy).⁸ In addition, the analysis conducted here suggests that units at high levels are likely to need larger budget reserves (in absolute value) than units at low levels if goal attainability across hierarchical levels is to be maintained.

IV. CONCLUSIONS

The paper shows that creating the performance goal for a unit by consolidating the goals of its subunits leads to assigned goals being either progressively harder or easier to meet at higher and higher levels of the corporate hierarchy. This suggests that in reality budgeting for units with multiple subunits involves more than just consolidation and probably entails the use of such devices as budget reserves to achieve the desired budget attainability.

APPENDIX

The theoretical analysis presented in the body of the paper focused on the aggregation of cost budgets. The intent of this appendix is to demonstrate how the analysis applies to the aggregation of revenue budgets and to the aggregation of a revenue and cost budget into a consolidated profit budget.

Case 1: The Aggregation of Sales Budgets

Assume units a and b , and group g are sales departments, and the revenue budget for group g is created by consolidating those of units a and b . Unlike cost, revenue is to be

⁵ Similar statements can also be found in teaching cases; see *Texas Instruments* (Harvard Business School Case No. 172-054) and Jacobson and Hillkirk (1986).

⁶ Throughout the paper, budgeting is assumed to be bottom-up. There may be situations where the process is top-down. That is, budgets are set for units at the top level first and then "unbundled" into budgets for units at lower and lower levels of the hierarchy. In that case, a reverse snowball effect is likely to be created: if the budgets for the top-level units are hard (easy) to meet, those for units at lower and lower levels are progressively easier (harder) to meet.

⁷ The budget reserve is an extra item added to a budget for no purpose other than to alter the attainability of the budget without changing the individual items in the budget. The device appears to be in use at many firms (e.g., Johnson & Johnson; see *Codman & Shurtleff*, Harvard Business School, Case No. 187-087).

⁸ Because the purpose of the budget reserve is to change the attainability of the consolidated goal but not that of the subunit goals, the reserve needs not and should not be allocated to the subunits. The analysis here suggests that the budget reserve will depend upon the number of subunits in the consolidated group and the degree of correlation in the performance measures.

maximized and a revenue budget is met when actual revenue equals or exceeds the budget goal. Let I be revenue and Γ the revenue budget goal. Then the attainability of Γ is $\text{pr}(I \geq \Gamma)$. The following results, implied by Theorem 1 and Corollary 1 respectively, show that the impact of the aggregation of sales budgets is similar to that of cost budgets—budgets of higher level sales units are either easier or harder to attain than the budgets of lower level sales units.

Corollary 2: $\text{pr}(I_a + I_b \geq \Gamma_a + \Gamma_b) > \text{pr}(I_a \geq \Gamma_a) = \text{pr}(I_b \geq \Gamma_b)$, if
 (1) (I_a, I_b) are bivariate normal and imperfectly correlated;
 (2) $\text{pr}(I_a \geq \Gamma_a) = \text{pr}(I_b \geq \Gamma_b) > 0.5$.

Corollary 3: $\text{pr}(I_a + I_b \geq \Gamma_a + \Gamma_b) < \text{pr}(I_a \geq \Gamma_a) = \text{pr}(I_b \geq \Gamma_b)$, if
 (1) (I_a, I_b) are bivariate normal and imperfectly correlated;
 (2) $\text{pr}(I_a \geq \Gamma_a) = \text{pr}(I_b \geq \Gamma_b) < 0.5$.⁹

Case 2: The Aggregation of Sales and Cost Budgets into a Profit Budget

Assume unit a is a sales department, unit b is a production department, and group g is a profit center. Let s_a be unit a 's stochastic revenue and e_b be unit b 's stochastic cost. Group g 's stochastic profit then equals $s_a - e_b$. Also, let the revenue goal of unit a be S_a and the cost goal of unit b be E_b . Thus, if one derives the profit goal for group g by consolidating the subunit goals, group g 's profit goal is $S_a - E_b$ and the chance of achieving it is $\text{pr}(s_a - e_b \geq S_a - E_b)$. The following corollaries demonstrate the impact of aggregation on budget attainability:

Corollary 4: $\text{pr}(s_a - e_b \geq S_a - E_b) < \text{pr}(s_a \geq S_a) = \text{pr}(e_b \leq E_b)$, if
 (1) $(s_a, -e_b)$ are bivariate normal and imperfectly correlated;
 (2) $\text{pr}(s_a \geq S_a) = \text{pr}(e_b \leq E_b) < 0.5$.

Corollary 5: $\text{pr}(s_a - e_b \geq S_a - E_b) > \text{pr}(s_a \geq S_a) = \text{pr}(e_b \leq E_b)$, if
 (1) $(s_a, -e_b)$ are bivariate normal and imperfectly correlated;
 (2) $\text{pr}(s_a \geq S_a) = \text{pr}(e_b \leq E_b) > 0.5$.

Corollary 4 is another form of Corollary 3, and Corollary 5 is another form of Corollary 2. To see that, replace I_a in Corollaries 2 and 3 by s_a , I_b by $-e_b$, Γ_a by S_a and Γ_b by $-E_b$, and keep in mind that $\text{pr}(-e_b \geq -E_b) = \text{pr}(e_b \leq E_b)$.

⁹ Let I be profit and Γ the profit goal. Then, Corollaries 3 and 4 show consolidating two difficult (easy) profit budgets is likely to produce an even more difficult (easy) profit budget.

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BOOK REVIEWS

Thomas H. Williams, Editor

Editor's Note: Two copies of books for review should be sent to Professor Thomas H. Williams, McIntire School of Commerce, University of Virginia, Charlottesville, VA 22903-2493. The policy of *The Accounting Review* is to publish only those reviews solicited by the Book Review Editor. Unsolicited reviews will not be accepted.

GEOFF BURROWS, *The Foundation: A History of the Australian Accounting Research Foundation, 1966-91*, (Caulfield, Vic: Australian Accounting Research Foundation, 1996, pp. 221, A\$25).

This book describes in detail the evolution of the Australian Accounting Research Foundation (AARF) from 1966 through 1991. The impetus of the AARF was the credit squeeze in Australia in the 1960s, which led to a wave of business collapses. Users of accounting information viewed the accounting profession in Australia as incompetent at best and culpable at worst. The greatest challenge faced by accounting rule-makers in general and the Australian Society of Certified Practising Accountants (the Society) and the Institute of Chartered Accountants in Australia (the Institute) in particular was restoring faith in the accounting system. The Society and the Institute jointly formed the AARF as a mechanism to increase research on the formulation and implementation of accounting. Early important figures include K. Little from Arthur Andersen and C. Andersen who were instrumental in designing what would become the AARF, and J. Kenley who examined the standard-setting process in the Anglo-American countries and South Africa.

The breadth of the AARF was unparalleled compared to such organizations as the FASB. Its charges included undertaking and supporting financial accounting research, devising private sector accounting standards, reviewing government legislation that affected accounting and researching practical tax issues. Throughout the 1970s, the major task of the AARF turned out to be a contentious, decade-long attempt to devise a method of current cost (inflation) accounting. Australian academics such as Chambers have long led the world in championing inflation accounting; unfortunately, interference by the government and business ensured that the inflation accounting project came to naught.

The failure of the inflation accounting project underscored the lack of a conceptual framework (CF) for accounting. Accordingly, the next major project of the AARF was devising a CF. The approach taken was unique: outside (of the AARF) "contractors" wrote monographs on the "building blocks" of accounting, e.g., defining assets, reporting entities, equity, and so on. From these building blocks, the AARF was to devise statements of accounting concepts (SACs). One such Statement, SAC No. 4, *Definition and Recognition of Financial Elements*, proved to be extremely controversial, particularly given that it seemed to mandate capitalization of leases heretofore considered operating. Business reaction was swift and negative. The Group of 100, comprised of the senior accountants from some 100 leading business and governmental entities, opposed SAS No. 4 as unworkable and dominated by academics who produce "thick, obscurely written standards."

Despite some failures (as can only be expected in an area as controversial as standard-setting), the AARF has been successful in joining the academic and practitioner bodies in Australia in joint research projects. The AARF also helped consolidate the standard-setting process and provide a theoretical underpinning to what had previously been ad hoc accounting standard setting by a wide variety of entities.

The book should prove to be interesting for students of accounting history and standard setting for several reasons. The author's description of the political turmoil inherent in standard setting is interesting and instructive.

Insights from these Australian experiences are useful in understanding better the U.S. regulatory process. The section on inflation accounting is also important as it provides a graphic example of the tension between "theoretically correct" accounting and accounting that the business community will accept.

KEVIN T. STEVENS

Associate Professor of Accountancy

DePaul University

ROBIN COOPER AND REGINE SLAGMULDER, *Target Costing and Value Engineering* (Portland, OR: Productivity Press, 1997, pp. xl, 379, \$50).

This is the first in a series of five volumes on Japanese cost management. The series will examine a total of 31 cases based on 25 companies. The seven cases in this volume are Nissan, Toyota, Komatsu, Olympus Optical, Sony, Topcon and Isuzu, all of which were published separately as Harvard Business School cases. Four of the seven were included in Robin Cooper's case book, *Cost Management in a Confrontation Strategy: Lessons from Japan* and much of that 1994 case book's materials on confrontation strategy and the survival triplet can be found in chapters 1 and 2 of this volume. Chapter 3 describes site selection. These first three chapters constitute Part One and, according to the preface, will be repeated in each of the five volumes of the series.

There is some material in Part Two that appears to this reviewer to be new; it is found in chapters 9–11. (Chapters 4–8 present and compare some processes and lessons that will be familiar to readers who have studied these cases.) Chapter 9 discusses many variables that influence the three main "sections" of target costing and value engineering (TC/VE)—market-driven costing, product-level TC/VE, and component-level TC/VE. Especially helpful is table 9–1, p. 189, a columnar comparison of how each of thirteen variables influences TC/VE at each of six firms. Chapter 10 presents a hypothetical case example of TC/VE for a simple product. Chapter 11 explores questions a manager should consider before attempting to implement TC/VE. Chapters 9 and 11 could serve as the core of a brief TC/VE handbook for managers.

Part Three consists of the seven cases presented as the last seven chapters. An appendix describes all 25 companies used in the five-volume series; the glossary defines 54 terms; and the index has approximately 300 entries and 30 with sub-entries. The ten-page "Selected Bibliography and References" is in three parts: abstracts of between 50 and 200 words for each of seventeen books, monographs and articles on TC/VE; 30 other TC/VE readings, mostly journal articles; and 26 background readings on competition, lean production and the lean enterprise, product development, technology diffusion and quality. Those ten pages will be invaluable to energetic students, writers of literature reviews and newcomers to modern management accounting.

Readers familiar with Robin Cooper's recent work will find this book to be a handy compilation of TC/VE cases and readings. Probably they also will find that significant, new material represents only a modest fraction of the book. Readers comparatively new to TC/VE will find this book a prized resource, well-written and an excellent window into a rich and exciting topic.

WILLIAM K. CARTER

Associate Professor of Accounting

University of Virginia

BOOKS RECEIVED APRIL 16, 1998 TO AUGUST 15, 1998

THOMAS G. CALDERON, ALEXANDER L. GABBIN, and BRIAN PATRICK GREEN, *A Framework for Encouraging Effective Teaching* (Harrisonburg, VA: Center for Research in Accounting Education, James Madison University, 1997, 214, Pb).

MICHAEL J. COMER, *Corporate Fraud* (Brookfield, VT: Ashgate Publishing Company, 1998, xviii, 676, Hb \$110.95).

MARC J. EPSTEIN, JOHN Y. LEE, and KAY M. POSTON, eds., *Advances in Management Accounting, Vol. 6* (Stamford, CT: JAI Press Inc., 1998, xvii, 213, Hb \$78.50).

ROB GRAY, et al., *The Valuation of Assets and Liabilities: Environmental Law and the Impact of the Environmental Agenda for Business* (Edinburgh: The Institute of Chartered Accountants of Scotland, 1998, xii, 145, Pb £15.00).

JAMES E. HUNTON, ed., *Advances in Accounting Behavioral Research, Vol. 1* (Stamford, CT: JAI Press Inc., 1998, xvi, 221, Hb \$78.50).

- CHERYL R. LEHMAN, ed., *Advances in Public Interest Accounting, Vol. 7* (Stamford, CT: JAI Press Inc., 1998, ix, 308, Hb \$78.50).
- ROBERT MEDNICK, *Keeping the Legacy Alive: Articles and Papers, 1979–1997* (Chicago: Andersen Worldwide, 1998, xviii, 164, Pb).
- RICHARD MORRIS, *Early Warning Indicators of Corporate Failure: A Critical Review of Previous Research and Further Empirical Evidence* (Brookfield, VT: Ashgate Publishing Company, 1997, xii, 425, Hb \$93.95).
- DIANE A. RIORDAN, DONNA L. STREET, and BRADLEY M. ROOF, eds., *Group Learning: Applications in Higher Education* (Harrisonburg, VA: Institute for Research in Higher Education, James Madison University, 1997, xii, 281, Hb).
- BILL N. SCHWARTZ and DAVID E. STOUT, eds., *Advances in Accounting Education: Teaching and Curriculum Innovations, Vol. 1* (Stamford, CT: JAI Press Inc., 1998, xxv, 277, Hb \$78.50).
- PHILIP H. SIEGEL, KURSHEED OMER, ANDRE DE KORVIN, and AWNI ZEBDA, eds., *Studies in Managerial and Financial Accounting, Vol. 7: Applications of Fuzzy Sets and the Theory of Evidence to Accounting, II* (Stamford, CT: JAI Press Inc., 1998, xvii, 310, Hb \$78.50).
- STEVE G. SUTTON, ed., *Advances in Accounting Information Systems, Vol. 6* (Stamford, CT: JAI Press Inc., 1998, x, 224, Hb \$78.50).
- RICHARD M. S. WILSON, ed., *Management Accounting, 2 Vols* (Brookfield, VT: Ashgate Publishing Company, 1997, 1, 484, xlv, 398, Hb \$349.95).

Editorial Data

Manuscripts submitted to *The Accounting Review* are assigned two reviewers. The following table contains information about turnaround time for reviewed manuscripts for the twelve month period ended May 31, 1998. Turnaround time is the number of days between the date of the editor's letter to the author(s) and the date that the manuscript and submission fee were received:

	<u>Number of Manuscripts</u>	<u>Cumulative Number</u>	<u>Cumulative Percent</u>
$0 \leq \text{Days} \leq 30$	6	6	2.8
$31 \leq \text{Days} \leq 60$	37	43	20.2
$61 \leq \text{Days} \leq 90$	128	171	80.3
$91 \leq \text{Days} \leq 120$	39	210	98.6
$121 \leq \text{Days}$	3	213	100.0

The mean review time was 75 days; the median review time was 78 days. A limited number of manuscripts are returned without review and such manuscripts are excluded from the turnaround time statistics reported above.

EDITORIAL POLICY AND STYLE INFORMATION

EDITORIAL POLICY

According to the policies set by the Publications Committee (which were endorsed by the Executive Committee and were published in the *Accounting Education News*, June 1987), *The Accounting Review* "should be viewed as the premier journal for publishing articles reporting the results of accounting research and explaining and illustrating related research methodology. The scope of acceptable articles should embrace any research methodology and any accounting-related subject, as long as the articles meet the standards established for publication in the journal....No special sections should be necessary. The primary, but not exclusive, audience should be—as it is now—academicians, graduate students, and others interested in accounting research."

The primary criterion for publication in *The Accounting Review* is the significance of the contribution an article makes to the literature.

The efficiency and effectiveness of the editorial review process is critically dependent upon the actions of both authors submitting papers and the reviewers. Authors accept the responsibility of preparing research papers at a level suitable for evaluation by independent reviewers. Such preparation, therefore, should include subjecting the manuscript to critique by colleagues and others and revising it accordingly prior to submission. The review process is not to be used as a means of obtaining feedback at early stages of developing the research.

Reviewers and associate editors are responsible for providing critically constructive and prompt evaluations of submitted research papers based on the significance of their contribution and on the rigor of analysis and presentation. Associate editors also make editorial recommendations to the editor.

MANUSCRIPT PREPARATION AND STYLE

The Accounting Review's manuscript preparation guidelines follow (with a slight modification) the B-format of the *Chicago Manual of Style* (14th ed.; University of Chicago Press). Another helpful guide to usage and style is *The Elements of Style*, by William Strunk, Jr., and E. B. White (Macmillan). Spelling follows *Webster's International Dictionary*.

FORMAT

1. All manuscripts should be typed on one side of 8½ x 11" good quality paper and be double spaced, except for indented quotations.
2. Manuscripts should be as concise as the subject and research method permit, generally not to exceed 7,000 words.
3. Margins of at least one inch from top, bottom and sides should facilitate editing and duplication.
4. To assure anonymous review, authors should not identify themselves directly or indirectly in their papers. Single authors should not use the editorial "we."
5. A cover page should show the title of the paper, the author's name, title and affiliation, any acknowledgments, and a footnote indicating whether the author would be willing to share the data (see last paragraph in this statement).

Pagination: All pages, including tables, appendices and references, should be serially numbered. The first section of the paper should be untitled and unnumbered. Major sections may be numbered in Roman numerals. Subsections should not be numbered.

Numbers: Spell out numbers from one to ten, except when used in tables and lists, and when used with mathematical, statistical, scientific, or technical units and quantities, such as distances, weights and measures. For example: *three days*; *3 kilometers*; *30 years*. All other numbers are expressed numerically.

Percentages and Decimal Fractions: In nontechnical copy use the word percent in the text.

Hyphens: Use a hyphen to join unit modifiers or to clarify usage. For example: *a well-presented analysis*; *re-form*. See *Webster's* for correct usage.

Key Words: The abstract is to be followed by four key words that will assist in indexing the paper.

ABSTRACT/INTRODUCTION

An Abstract of about 100 words should be presented on a separate page immediately preceding the text. The Abstract should concisely inform the reader of the manuscript's topic, its methods and its findings. Key Words and the Data Availability statements should follow the Abstract. The text of the paper should start with a section labeled "I. Introduction," which provides more details about the paper's purpose, motivation, methodology and findings. Both the Abstract and the introduction should be relatively non-technical, yet clear enough for an informed reader to understand the manuscript's contribution. The manuscript's title, but neither the author's name nor other identification designations, should appear on the Abstract page.

TABLES AND FIGURES

The author should note the following general requirements:

1. Each table and figure (graphic) should appear on a separate page and should be placed at the end of the text. Each should bear an Arabic number and a complete title indicating the exact contents of the table or figure.
2. A reference to each graphic should be made in the text.
3. The author should indicate by marginal notation where each graphic should be inserted in the text.
4. Graphics should be reasonably interpreted without reference to the text.
5. Source lines and notes should be included as necessary.

Equations: Equations should be numbered in parentheses flush with the right-hand margin.

DOCUMENTATION

Citations: Work cited should use the "author-date system" keyed to a list of works in the reference list (see below). Authors should make an effort to include the relevant page numbers in the cited works.

1. In the text, works are cited as follows: authors' last name and date, without comma, in parentheses: for example, (Jones 1987); with two authors: (Jones and Freeman 1973); with more than two: (Jones et al. 1985); with more than one source cited together (Jones 1987; Freeman 1986); with two or more works by one author: (Jones 1985, 1987).
2. Unless confusion would result, do not use "p." or "pp." before page numbers: for example, (Jones 1987, 115).
3. When the reference list contains more than one work of an author published in the same year, the suffix a, b, etc. follows the date in the text citation: for example, (Jones 1987a) or (Jones 1987a; Freeman 1985b).
4. If an author's name is mentioned in the text, it need not be repeated in the citation; for example, "Jones (1987, 115) says...."
5. Citations to institutional works should use acronyms or short titles where practicable; for example, (AAA ASOBAT 1966); (AICPA Cohen Commission Report 1977). Where brief, the full title of an institutional work might be shown in a citation: for example, (ICAEW The Corporate Report 1975).
6. If the manuscript refers to statutes, legal treatises or court cases, citations acceptable in law reviews should be used.

Reference List: Every manuscript must include a list of references containing only those works cited. Each entry should contain all data necessary for unambiguous identification. With the author-date system, use the following format recommended by the *Chicago Manual*:

1. Arrange citations in alphabetical order according to surname of the first author or the name of the institution responsible for the citation.
2. Use author's initials instead of proper names.
3. Date of publication should be placed immediately after author's name.
4. Titles of journals should not be abbreviated.
5. Multiple works by the same author(s) in the same year are distinguished by letters after the date.
6. Inclusive page numbers are treated as recommended in *Chicago Manual* section 8.67.

Sample entries are as follows:

American Accounting Association, Committee on Concepts and Standards for External Financial Reports. 1977. *Statement on Accounting Theory and Theory Acceptance*. Sarasota, FL: AAA.

- Demski, J. S., and D. E. M. Sappington. 1989. Hierarchical structure and responsibility accounting. *Journal of Accounting Research* 27 (Spring): 40–58.
- Dye, R., B. Balachandran, and R. Magee. 1989. Contingent fees for audit firms. Working paper, Northwestern University, Evanston, IL.
- Fabozzi, F., and I. Pollack, eds. 1987. *The Handbook of Fixed Income Securities*. 2nd edition. Homewood, IL: Dow Jones-Irwin.
- Kahneman, D., P. Slovic, and A. Tversky, eds. 1982. *Judgment Under Uncertainty: Heuristics and Biases*. Cambridge, U.K.: Cambridge University Press.
- Porcano, T. M. 1984a. Distributive justice and tax policy. *The Accounting Review* 59 (October): 619–636.
- . 1984b. The perceived effects of tax policy on corporate investment intentions. *The Journal of the American Taxation Association* 6 (Fall): 7–19.
- Shaw, W. H. 1985. Empirical evidence on the market impact of the safe harbor leasing law. Ph.D. dissertation, University of Texas at Austin.
- Sherman, T. M., ed. 1984. *Conceptual Framework for Financial Accounting*. Cambridge, MA: Harvard Business School.

Footnotes: Footnotes are not used for documentation. Textual footnotes should be used only for extensions and useful excursions of information that if included in the body of the text might disrupt its continuity. Footnotes should be consecutively numbered throughout the manuscript with superscript Arabic numerals. Footnote text should be doubled-spaced and placed at the end of the article.

SUBMISSION OF MANUSCRIPTS

Authors should note the following guidelines for submitting manuscripts:

1. Manuscripts currently under consideration by another journal or publisher should not be submitted. The author must state that the work is not submitted or published elsewhere.
2. In the case of manuscripts reporting on field surveys or experiments, four copies of the instrument (questionnaire, case, interview plan or the like) should be submitted.
3. Four copies should be submitted together with a check in U.S. funds for \$75.00 for members or \$100.00 for nonmembers of the AAA made payable to the American Accounting Association. Effective January 1990, the submission fee is nonrefundable.
4. The author should retain a copy of the paper.
5. Revisions must be submitted within 12 months from request, otherwise they will be considered new submissions.

COMMENTS

Comments on articles previously published in *The Accounting Review* will be reviewed (anonymously) by two reviewers in sequence. The first reviewer will be the author of the original article being subjected to critique. If substance permits, a suitably revised comment will be sent to a second reviewer to determine its publishability in *The Accounting Review*. If a comment is accepted for publication, the original author will be invited to reply. All other editorial requirements, as enumerated above, also apply to proposed comments.

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POLICY ON DATA AVAILABILITY

The following policy has been adopted by the Executive Committee in its April 1989 meeting.

"An objective of (*The Accounting Review, Accounting Horizons, Issues in Accounting Education*) is to provide the widest possible dissemination of knowledge based on systematic scholarly inquiries into accounting as a field of professional research, and educational activity. As part of this process, authors are encouraged to make their data available for use by others in extending or replicating results reported in their articles. Authors of articles which report data dependent results should footnote the status of data availability and, when pertinent, this should be accompanied by information on how the data may be obtained."

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OCTOBER 1998 PLACEMENT ADS

The deadline for information to be included in the "Placement Information" section is two months prior to the date of publication. The Review is published on the first day of January, April, July and October. Placement advertising and replies should be sent to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399, ATTENTION: ADVERTISING DEPT. All replies to box numbers should be on separate sheets to facilitate forwarding. See notice in this issue for additional information.

- 401 ASSISTANT FINANCE MANAGER. Nike, Inc. is in need of an Assistant Finance Manager, located on our World Campus in Beaverton, Oregon. This person will perform all duties associated with the reconciliation of new store budgets, remodels, and facilities expenses on a monthly basis. Analyze and suggest ways to bring projects under budget. Work closely with international counterparts on new Nike stores to ensure budgetary items are tracked correctly. Notify management teams on budget variance. Ensure accounts receivable are completed on a timely basis. Work with management teams on budget proposals for upcoming fiscal years. Assist with supervision of temporary labor within department. Bachelors degree in Accounting or Business preferred. Two to four years of previous accounting experience using Oracle accounting systems. Strong organization, written and verbal communication skills. Experience using general ledgers. Strong software skills to include Excel, Word and Windows 95 format. Interested candidates please mail your resume to Nike, 20325 NW Von Neumann Drive, Aloha, Oregon 97006 or fax (503) 532-7329, Attn: Michelle, HR Recruiter, Retail division.
- 402 LOYOLA MARYMOUNT UNIVERSITY invites applications for a tenure-track position in Accounting at the Assistant Professor level beginning Fall 1999. Salary is competitive. A completed doctorate (or dissertation stage) in accounting is required. Work experience in the accounting field and professional certification are desirable. Teaching is our highest priority, with classes at the undergraduate and M.B.A. levels. You must also be willing to engage in scholarship leading to publications in refereed academic and professional journals. The College is AACSB accredited at both the undergraduate and M.B.A. levels, and is housed in the Hilton Center for Business, opened in 1995. LMU is located in a beautiful section of Los Angeles, near the coast and convenient to the airport. Resumes should be sent to Dr. Alan Cherry, College of Business, LMU, Los Angeles, CA 90045-8385, who will attend the AAA meeting in New Orleans. LMU is an Equal Opportunity/Affirmative Action Employer.
- 403 UNIVERSITY OF MISSOURI-COLUMBIA School of Accountancy is seeking applications for a tenure-track faculty position at the Assistant Professor level in Financial Accounting for Fall 1999. The position requires a completed Ph.D. or D.B.A. with research and teaching interests in Financial Accounting. Faculty members generally teach six hours per semester and are expected to actively pursue a program of scholarly research. Applications are encouraged from both new Ph.D.s and experienced Assistant Professors. Salary and research support are competitive. The University of Missouri is an Equal Opportunity, Affirmative Action Employer. Applications from minority and women candidates are strongly encouraged for this position. Please send application letter and vita to Dr. Jere R. Francis, Chair, Faculty Recruiting Committee, School of Accountancy, University of Missouri-Columbia, Columbia, MO 65211.

- 404 THE UNIVERSITY OF WISCONSIN-Whitewater Accounting Department announces one full time tenure-track teaching position starting August 1999. A second position may be available. Responsibilities include teaching undergraduate and/or graduate level accounting courses, along with advising, service and publication/scholarly activities (including grant writing). The minimum qualifications are an earned terminal degree or being close to receiving the degree, and the ability to teach introductory financial and/or managerial accounting. Professional certification desirable. For the first position, candidates with research and teaching interests in auditing with information systems secondary are preferred. For the second (possible) position, candidates with interests in advanced managerial and financial accounting are preferred. Interested persons should apply in writing to Dr. Kenneth Macur; macurk@mail.uww.edu; Department of Accounting - C5019; UW-Whitewater, Whitewater, WI 53190. See web site www.uww.edu/business/depts/acctg/position.htm for complete details. The application deadline is October 15, 1998 or until filled. UW-Whitewater is an AA/EEO employer. Women and minorities are encouraged to apply.
- 405 GEORGETOWN's School of Business seeks to appoint two outstanding scholars at the level of Associate or Full Professor. Appointment at the rank of Assistant Professor is available for individuals with degree in hand who are still establishing their research presence. All candidates must have a solid record of publications in top tier, refereed journals as well as superior teaching evaluations. These positions will remain open until filled. Women and minorities are strongly encouraged to apply. Georgetown University is an Equal Opportunity/Affirmative Action Employer. Send c.v. to Professor Patricia M. Fairfield, Georgetown School of Business, Old North Building, Georgetown University, Washington, D.C. 20057.
- 406 UNIVERSITY OF VIRGINIA, Darden Graduate Business School invites applications in the accounting area at all ranks beginning Fall 1999. Applicants should possess a primary research, teaching and case writing interest in management control systems or cost accounting with the practicing manager in mind. Candidates for a senior position should possess an excellent record in these areas and tenure-track candidates should exhibit promise for excellence in these areas. Candidates should also be able to teach in the introductory financial reporting part of our required M.B.A. curriculum. The Darden School especially encourages applications from women and minority candidates. Pertinent materials should be sent to James R. Freeland, Associate Dean for Faculty, PO Box 6550, Darden School, University of Virginia, Charlottesville, VA 22906. The University of Virginia is an Affirmative Action/Equal Opportunity Employer.
- 407 EMORY UNIVERSITY's Roberto C. Goizueta Business School seeks applicants for faculty positions in accounting at all ranks. Salaries and research support are competitive. Qualified applicants for a Full or Associate Professor position will possess strong records of research productivity published in the Journal of Accounting Research, The Accounting Review, Journal of Accounting and Economics, Contemporary Accounting Research, and other journals, as well as commitment to and a record of success in teaching in business school programs (undergraduate, M.B.A., Ph.D., and/or Executive Education). Successful candidates must possess national reputations for scholarship and service, and a commitment to institution-building. The application process will remain open until the position is filled, and we expect to begin bringing candidates to campus early in the fall semester. Qualified applicants for junior positions must possess good research skills as evidenced by a doctoral degree (completed or close to completion), and evidence of a strong commitment to both teaching and research. The deadline for our receipt of application packets, containing a vita, two letters of recommendation, and a working paper to be presented in a workshop during a campus visit, is February 1, 1999. Applications for these positions should be sent to Professor Consuelo L. Kertz, Goizueta Business School, Emory University, 1300 Clifton Road, Atlanta, GA 30322. Emory University is an Equal Opportunity, Affirmative Action employer. Applications from qualified minority and female candidates are strongly encouraged.

- 408 LOUISIANA STATE UNIVERSITY, Department of Accounting in the E. J. Ourso College of Business Administration invites applications for two or more anticipated tenure-track openings to begin August, 1999. Applications at the Assistant and Associate rank will be considered for a specialty in accounting information systems. Applications in other specialty areas will also be considered. The positions require that the doctoral degree in Accounting be completed, or near completion, by the date of appointment. If degree is not completed by date of appointment, rank will be at Instructor level. C.P.A. is desired. Faculty are expected to teach undergraduate and graduate courses, be actively involved in academic research, and provide service to the profession and the university. Review of applications will begin September 1, 1998, and will continue until candidates are selected. Please send a letter of application, vita and references to Don W. Finn, Chair, Department of Accounting, 3101 CEBA Building, Louisiana State University, Ref: #006008 & #000314, Baton Rouge, LA 70803.
- 409 BELLARMINE COLLEGE, W. Fielding Rubel School of Business invites applications for a tenure-track Assistant Professor of Accounting beginning Fall 1999. A doctorate in Accounting with professional certification and experience is preferred. (ABDs and M.B.A./CPAs with extensive teaching and professional experience will be considered.) Salary is AACSB competitive. Teaching and research interests may be in any area. Our faculty is progressive and cooperative. The School offers undergraduate majors in Accounting, Business, International Business and Economics and fully integrated Executive and M.B.A. programs. Bellarmine enjoys a reputation as a high quality, selective, student-teaching centered liberal arts college. Two thousand three hundred students are enrolled in undergraduate and graduate programs in arts and sciences, business, education and nursing. Our representative will be at the AAA meeting in New Orleans. Send vita to Dean Edward T. L. Popper, W. Fielding Rubel School of Business, Bellarmine College, 2001 Newburg Road, Louisville, KY 40205-0671, fax: (502) 452-8013, email: krichardson@bellarmine.edu.
- 410 UNIVERSITY OF DAYTON seeks applications for two positions beginning August 1999, one at the Full/Associate Professor level, and one at one at the Assistant/Associate level. Ph.D. in Accounting from an AACSB program is required, with ABD close to completion considered for Assistant. Collegiality is essential. The senior position requires superior research and teaching credentials in Managerial Accounting, as well as a demonstrated commitment to undergraduate, M.B.A., and team teaching, as well as the maintenance of strong ties with the local business community. The second position requires a commensurate record/potential, preferably in two teaching areas; professional certification is desirable. Research support is available. The undergraduate program is AACSB accredited, with an M.B.A. concentration beginning 1999. The University of Dayton is a Catholic coeducational institution with a total enrollment of almost 11,000. UD is an EEO/AA employer. Women, minorities, individuals with disabilities, and Vietnam era veterans are encouraged to apply. Qualified applicants should send a letter of interest and vita to Ron Burrows, Chair, Department of Accounting, University of Dayton, Dayton, OH 45469-2250. Phone: (937) 229-4616, fax (937) 229-3301, email: burrows@udayton.edu.

- 411 **GEORGIA SOUTHERN UNIVERSITY** invites applications for a tenure-track position at the rank of Assistant Professor to begin August 1, 1999. The applicant's primary teaching and research interest, background, and ability should be in the Systems and/or Auditing area at both the graduate and undergraduate levels. The applicant should have earned a Ph.D. or DBA in Accounting or be ABD within one year of completion to be considered. One to two years public accounting experience preferred. Professional certification as a CPA is preferred. GSU's College of Business Administration and the School of Accountancy are both accredited by the AACSB. Georgia Southern University has a strong commitment to teaching. Applicants should send a letter and resume to Dr. Leslie B. Fletcher, Search Committee Chair, School of Accountancy, Georgia Southern University, PO Box 8141, Statesboro, GA 30460-8141. Applications should be postmarked by October 30, 1998. Individuals who need reasonable accommodations under the Americans with Disabilities Act in order to participate in the application process should notify the search chair. GSU is an Equal Opportunity Affirmative Action institution. Georgia is an Open Records state.
- 412 **UNIVERSITY OF NORTHERN IOWA** invites applicants for a tenure-track position (systems emphasis) beginning Fall 1999 at the Assistant Professor rank. A doctorate (ABDs will be considered) from an AACSB-accredited institution, teaching excellence, and scholarship potential are required. Professional certification is desirable. The AACSB-accredited College of Business Administration (CBA) has 65 full-time faculty members, approximately 2,600 undergraduate majors, and 200 M.B.A. students. CBA activities are supported by 300 personal computers, a College-wide network, multimedia classrooms, and the University mainframe. For full consideration, applications should be received by September 30, 1998. Contact Professor Gerald Smith, Head, Department of Accounting, University of Northern Iowa, Cedar Falls, IA 50614-0127. Phone: (319) 273-2394, fax: (319) 273-2922; email: Gerald.Smith@uni.edu. UNI is an Equal Opportunity educator and employer with a comprehensive plan for Affirmative Action. For more information about the UNI Department of Accounting, see <http://www.cba.uni.edu/accounting/>.
- 413 **UNIVERSITY OF MICHIGAN Business School** has at least one entry-level tenure track position available in Accounting starting in the 1999-2000 academic year. Applications should include a research paper based on the candidate's dissertation, any other published or unpublished research, evidence of teaching experience (if any), and a curriculum vita that includes three references. All areas of accounting will be considered with the exception of Auditing and Management Information Systems. Applications should be sent to Professor Douglas J. Skinner, Accounting Department, University of Michigan Business School, 701 Tappan Street, Ann Arbor, MI 48109-1234. The University of Michigan offers competitive salary and fringe benefits and is a nondiscriminatory/affirmative action employer.
- 414 **MICHIGAN TECH UNIVERSITY.** Accounting: Tenure-track or visiting position beginning August 1999. Rank open but preference for Assistant/Associate level. Teaching responsibilities in financial accounting and auditing. Ph.D. in accounting (or an ABD in the first stages of the dissertation) and promise of excellence in teaching and research required for Assistant Professor appointment; Ph.D. and demonstrated excellence in teaching and research required for appointment at a higher level. M.B.A.-CPA or JD-CPA required for appointment as a lecturer. Competitive salary and teaching load. Send letter of application, resume and names and addresses of three references to Dean Eugene Klippel, School of Business, Michigan Tech University, Houghton, MI 49931. Michigan Tech, established in 1885, is a nationally recognized research university. Located in a community of 20,000 on Michigan's Upper Peninsula, MTU offers a friendly, safe and affordable environment. MTU is an equal opportunity educational institution and an equal opportunity employer.

- 415 **INDIAN INSTITUTE OF MANAGEMENT BANGALORE INDIA** invites applications for permanent positions in Accounting and Finance. Appointments at Assistant, Associate or Full Professor levels will be considered. Applications are also invited for full-time visiting positions for one or more years, or for a part of a year. All accounting- and finance-related discipline areas will be considered for permanent as well as visiting positions. Candidates should have a Ph.D. or equivalent and are expected to be productive researchers and effective teachers at M.B.A. and Ph.D. levels. Campus housing will be provided depending on availability. The Institute's terms of appointment compare favorably with those of similar institutions in India. Interested candidates should send a resume to Dean, Indian Institute of Management Bangalore, Bannerghatta Road, Bangalore 560 076 INDIA. Phone: (0091) (080) 664 1213, fax: (0091) (080) 664 4050, email: nagadev@iimb.ernet.in Web page <http://www.iimb.ernet.in>.
- 416 **SIMON FRASER UNIVERSITY.** The Faculty of Business Administration at SFU invites applications for tenure-track appointments in Financial Accounting and Managerial Accounting. Ph.D. in hand or near completion. Rank: Assistant/Associate. Salary: competitive within Canada. Successful candidates will have strong research and teaching abilities with established research programs in one of the areas above and an interest in teaching at both the undergraduate and graduate levels. Start date: September 1999 or at mutually agreed upon time. In accordance with Canadian Immigration requirements, this announcement is directed, in the first instance, to Canadian citizens and Permanent Residents. Simon Fraser University is committed to the principle of equity in employment and offers equal employment opportunities to qualified applicants. Positions subject to budgetary approval. Send curriculum vita and names of three referees to: Lawrence Pinfield, Chair, Appointments Committee, Faculty of Business Administration, Simon Fraser University, 8888 University Drive, Burnaby, British Columbia V5A 1S6 Canada.
- 417 **UNIVERSITY OF SOUTHERN MAINE.** The Department of Accounting invites applications for two tenure-track positions at the Assistant Professor rank starting Fall 1999. One position will emphasize Managerial Accounting and the other will emphasize Financial. A secondary teaching emphasis is welcomed, especially in the area of Systems. Teaching effectiveness is emphasized with scholarly activity expected. The ideal candidate will have completed requirements for a Ph.D. or DBA with concentration in accounting. Professional experience and CPA/CMA are positive additional factors. Send letter of application, vita and names/phone numbers of three references to: Dr. Steve Jackson, USM School of Business, 96 Falmouth Street, Box 9300, Portland, ME 04103-9300. Email: sjackson@usm.maine.edu; fax: (207) 780-4662. USM is an EEO/AA employer and especially welcomes applications from ethnic minorities and women. Review of materials will begin immediately and continue until position is filled. We will be attending the annual AAA meeting in New Orleans, August 1998.
- 418 **UNIVERSITY OF MONTANA, MISSOULA,** Department of Accounting and Finance has an opening for Department Chair and for an Assistant/Associate Professor of Accounting. Both positions require the Ph.D./D.B.A. Department Chair applicants should be qualified for the rank of Full Professor with strong teaching and research records. Areas of interest for both positions are: Systems, International, Financial, Managerial and Financial Management. Positions available August 1999. The University of Montana is one of the nation's outstanding public universities, committed to liberal arts education, research and strong professional programs. It is located in Missoula, a cosmopolitan Rocky Mountain community of 80,000, often singled out in national publications for its quality of life. In 1996, the School of Business Administration moved to the new William and Rosemary Gallagher Business Building complete with high tech teaching and research facilities. AA/EEO. Contact Dr. Bruce P. Budge, School of Business Administration, Missoula, MT 59801. Phone: (406) 243-6702, fax: (406) 243-2086, email: budge@selway.unt.edu.

- 419 NORTH DAKOTA STATE UNIVERSITY invites applications for an open rank position in Accounting (tenure-track) starting August 16, 1999. Minimum qualifications: Ph.D. in Accounting (ABDs nearing completion will be considered), quality teaching record, evidence of research potential, and good communication/interpersonal skills. Ability to teach Accounting Information Systems and Government/Not-for-Profit Accounting. Preferred qualifications: Ph.D. degree in accounting and publication record in accounting. Responsibilities include teaching courses in Accounting at undergraduate and graduate levels including Accounting Information Systems and Government/Not-for-Profit Accounting, conduct research, advise students, provide service to the college, university, community and profession. Applications are accepted until the position is filled. Salary and rank are commensurate with qualifications and experience. Send letter of application, vita, transcripts, teaching evaluations, list of three references and copies of publications to Dean Jay A. Leitch, College of Business Administration, North Dakota State University, PO Box 5137, Fargo, ND 58105-5137. Web site: www.ndsu.nodak.edu/cba/.
- 420 SEATTLE UNIVERSITY invites applications and nominations for a one-year accounting position in the area of Financial Accounting at the graduate and undergraduate levels. Available Fall 1999. The candidate must hold a Ph.D. and appointment as Assistant Professor or higher, in accounting. The candidate is expected to have an established record as an effective teacher. Seattle University business school is AACSB-accredited with approximately 1,300 students in its graduate and undergraduate programs. The M.B.A. program includes a concentration in Accounting. Qualified candidates should send inquires and resumes by October 1, 1998 to David E. Tinius, Chair, Department of Accounting, Albers School of Business Economics, Seattle University, 900 Broadway, Seattle, WA 98122. Phone: (206) 296-5690, email: dtinius@seattleu.edu. Representatives of the department will be available to meet with candidates at the August national meeting of the American Accounting Association.
- 421 UNIVERSITY OF ARIZONA'S Department of Accounting invites applications for Assistant, Associate, Full Professors, full and part time Adjunct Lecturers of Accounting. Visiting positions may also be available at all ranks for academic year 1999-2000. Applicants for Assistant rank should possess a Ph.D. or be nearing completion. Advanced rank applicants must possess an earned doctorate and an established record of recent and continuing research and quality teaching. All tenure-track applicants must be committed to a continuing research program. Visitors/lecturers with a Ph.D., pertinent experience, and a CPA certificate will be given preference. Review of applications will begin November 2, 1998. This announcement will remain open until the positions are filled. Send vita and a letter indicating position of interest to: Professor Dan S. Dhaliwal, Head, Department of Accounting, McClelland Hall 301, PO Box 210108, University of Arizona, Tucson, AZ 85721-0108. The University of Arizona is an EEO/AA Employer M/W/D/V.
- 422 LEHIGH UNIVERSITY invites applications for a tenure-track position at the Assistant Professor level beginning Fall 1999. Candidates must have a Ph.D., DBA or be near completion. The applicant's primary research and teaching interests should be in the Tax area, with a secondary interest in Financial Accounting. The Accounting Program seeks a balance between teaching performance and research productivity. Our undergraduate programs are fully accredited, including Type A accounting accreditation, as is our college M.B.A. program. Please submit applications before November 15, 1998. Contact Kenneth P. Sinclair, Accounting Program Director, Lehigh University, Rauch Business Center #37, 621 Taylor Street, Bethlehem, PA 18015. Lehigh is an Equal Employment Opportunity/Affirmative Action Employer.

- 423 UNIVERSITY OF ILLINOIS, Department of Accountancy is recruiting faculty for tenure-track appointments with special emphasis on appointments at the Associate and Full Professor levels. Applicants for senior positions should have a strong research record and the ability to participate in doctoral education and curriculum development at the undergraduate and graduate levels. In addition, nontenure track lecturer and visiting positions may become available. Applicants should submit a resume, which lists research publications and courses taught. Compensation is competitive and will be commensurate with the appointment level and applicant's record. To ensure full consideration, applications should be received by October 15, 1998. The Department of Accountancy is an affirmative action employer and encourages applications from members of minority groups. Correspondence and resumes should be sent to Professor Gene Willis, Head, Department of Accountancy, 360 Commerce West, College of Commerce and Business Administration, University of Illinois, 1206 S. Sixth Street, Champaign, IL 61820.
- 424 EASTERN MICHIGAN UNIVERSITY seeks applicants for a tenure-track Assistant Professor position available Fall 1999. Ph.D. or DBA with accounting major preferred, advanced doctoral candidates considered; substantial evidence of potential for excellence in teaching and research required. CPA certification accompanied by field experience and teaching experience at a collegiate school of business desired. Flexibility regarding instructional area is necessary with introductory accounting and auditing the probable primary areas. Other duties include maintaining strong ties to the professional accounting community, developing curriculum and advising students. Salary competitive. EMU is AACSB accredited. We value diversity and encourage applications from women and members of minority groups. Submit letter of interest, cv, copies of transcripts, teaching evaluations and three letters of recommendation by December 4, 1998 to Position F9900, 202 Bowen, Eastern Michigan University, Ypsilanti, MI 48197. AA/EOE.
- 425 COLUMBIA BUSINESS SCHOOL seeks applications for faculty positions in accounting. Rank is open. Candidates with an interest in Financial Accounting will be preferred. Qualified applicants will possess a doctoral degree (or be close to completion) and evidence a strong commitment to both teaching and research. We offer a highly supportive research environment and easy interaction with faculty in other disciplines. Salary and benefits are competitive. Please send resume and a research paper to: Jacob K. Thomas, Columbia Business School, 3022 Broadway, 620 Uris Hall, New York, NY 10027. Columbia Business School is an Equal Opportunity/Affirmative Action Employer. Women and minorities are especially encouraged to apply.
- 426 FURMAN UNIVERSITY seeks to fill a tenure-track position in accounting at the Assistant Professor level, effective Fall 1999. A doctorate is preferred; a candidate with a master's and professional certification may be considered. The position requires teaching excellence, a sustained program of scholarly and professional activity, and effective institutional service. The candidate must be able to teach in more than one area of accounting. Furman is an independent, highly selective, liberal arts college of 2,500 students. The Department of Economics and Business Administration is composed of 14 faculty, including three in accounting. The Department graduates approximately 100 students a year, including 15-20 in accounting. Applicants should submit a letter of application, curriculum vita, three letters of reference, and a statement of teaching philosophy to Dr. Lawrence Kessler, Department of Economics and Business Administration, Furman University, Greenville, SC 29613. Salary will be competitive and commensurate with qualifications and experience. Furman University is an AA/EOE.

- 427 BOSTON COLLEGE, Carroll School of Management invites applications for two tenure-track accounting positions for Fall 1999. The qualifications include a demonstrated interest in and capacity to do publishable scholarly research, and a high level of teaching competence and innovation. We seek individuals with an openness to diverse intellectual outlooks and research methodologies, and an appreciation for Boston College's liberal arts tradition and strong Jesuit education philosophy that emphasizes a social justice perspective. We offer a collegial environment, an energetic faculty with a variety of intellectual interests and close ties to the Boston financial and academic communities. The Carroll School of Management is an Equal Opportunity Employer and strongly encourages applications from individuals who will expand the ethnic and gender diversity of our faculty. Direct inquiries to Jeffrey Cohen, Department Chair, Department of Accounting, Carroll School of Management, Boston College, Chestnut Hill, MA 02167.
- 428 UNIVERSITY OF PENNSYLVANIA. Applications for positions in accounting, at all professional ranks, are invited from qualified persons. A Ph.D. is required. Demonstrated ability or potential for effective teaching and quality research are important considerations. The deadline for applications is January 15, 1999. The University of Pennsylvania is an Equal Opportunity/Affirmative Action Employer. Interested persons should send their resume including educational background, professional experience, publications, personal data and, if applicable, a dissertation proposal and abstract to Professor Stanley Baiman, Accounting Department, University of Pennsylvania, Suite 2400 Steinberg Hall-Dietrich Hall, Philadelphia, PA 19104-6365.
- 429 GEORGIA STATE UNIVERSITY invites applications for the position of Director of the School of Accountancy starting July 1999. The Director provides leadership for the School's degree programs, and its related research and continuing education activities, is responsible for budgetary and personnel decisions; serves as a liaison to the business community and alumni; and oversees the Controllers RoundTable. Candidates should possess strong leadership and administrative skills. Candidates should have a record of achievement to warrant appointment at the rank of professor in the School. Candidates with exceptional alternative qualifications can be considered. Preference given to applications received by December 1, 1998. Send letter of application and resume, or nominations to Gerald D. Gay, Chair, Search Committee for Director of School of Accountancy, Department of Finance, College of Business Administration, Georgia State University, University Plaza, Atlanta, GA 30303. An Equal Educational and Employment Opportunity Institution.
- 430 NORTHEASTERN UNIVERSITY invites applications for a tenure-track position at the Assistant and/or Associate Professor rank in Accounting effective September 1999. Candidates must possess the doctoral degree and have a strong commitment to excellence in teaching and scholarly research. Candidates with an established publication record are preferred. Northeastern is a large urban university with the main campus located in the historic and culturally rich Fenway section of Boston. The College of Business Administration is one of nine colleges within the University and has undergraduate, M.B.A., Executive M.B.A., MS/M.B.A. in Professional Accounting and MS Tax Programs. The College is AACSB accredited. Please send vita to Dr. Paul A. Janell, Accounting Group, 404 Hayden Hall, Northeastern University, Boston, MA 02115, email: pjanell@CBA.neu.edu. Northeastern is an Equal Opportunity/Affirmative Action Employer.

- 431 INDIANA UNIVERSITY SOUTH BEND has a full-time accounting position open for Fall 1999. Rank subject to applicant's qualifications. Teaching of Accounting Information Systems at the undergraduate, M.B.A. and M.S. in Accounting levels required. Ability to teach other accounting courses is a plus. D.B.A. or Ph.D. in accounting required. Professional certification will be considered a plus. The teaching load is three courses (9 semester hours). Research, publication and service are expected. Before December 1, 1998, send letter of application, resume, graduate and undergraduate transcripts, evidence of teaching ability, research and publication, and three letters of reference. The screening of candidates will begin thereafter, with the position remaining open until filled. IUSB is an AA/EEO employer that actively seeks minority and female applications. Contact Dr. John R. Swanda, Jr., Dean, Division of Business and Economics, Indiana University South Bend, PO Box 7111, South Bend, IN 46634-7111. Fax: (219) 237-4366, email: Jswanda@iusb.edu.
- 432 PURDUE UNIVERSITY, West Lafayette, Indiana. Applicants are invited for positions in accounting. Rank is at either the Assistant or Associate Professor level. Appointment begins August 1999. A Ph.D. or D.B.A. is required. Candidates for Assistant Professor must exhibit capacity for quality research and teaching. Candidates for Associate Professor must have an established record of excellence in research, teaching, and service on doctoral dissertation committees. Applications will be reviewed beginning October 1, 1998. Applications should be sent to Professor William Kross, Krannert School of Management, Purdue University, West Lafayette, IN 47907. Phone: (765) 494-5907. Purdue is an Affirmative Action, Equal Opportunity Employer.
- 433 St. Louis, Missouri. Position opening for Financial Controller to report to the Chief Financial Officer; assist management in strategic planning. Oversee the operation of various companies in different industries. Prepare, monitor and analyze annual budgets for the companies. Be responsible for individual and consolidated financial analysis and reporting. B.A./M.B.A. in Accounting and Finance respectively. One year experience. Forty hours per week. \$50,000 per year. The Job Order # for the job opportunity is 590276. Send resume to Shirley J. Gregory, Missouri Division of Employment Security, 1411 Main Street, Kansas City, MO 64105. Must have proof of legal authority to work in the United States.
- 434 BARUCH COLLEGE. The Stan Ross Department of Accountancy invites applications for anticipated positions in Accounting and Taxation for tenure track positions at all ranks. Rank and salary are dependent on qualifications. For positions as an Assistant Professor, candidates should have a doctoral degree in Accounting or be close to completion of that degree. For ranks above Assistant Professor, the requirements are a record of publication, demonstrated teaching effectiveness, and a desire to work with doctoral students. Priority will be given to candidates in the area of Auditing. Please submit curriculum vita and recent work of a research proposal by February 17, 1999, to Professor Joseph Weintrop, Baruch College, 17 Lexington Avenue, Box E-0725, New York, NY 10010. An AA/EO/IRCA/ADA employer.
- 435 COLUMBUS STATE UNIVERSITY. The Abbott Turner College of Business invites application for tenure track appointment as Assistant Professor of Accounting starting Fall 1999. Desired qualifications include earned doctorate in accounting, with primary specialization in Auditing and Financial Accounting. Columbus State University, with an enrollment of 5,500, is a member of the University System of Georgia. The College of Business has approximately 1,000 undergraduate students with majors in accounting, computer information systems, finance, management, marketing and general business, an M.B.A. program with approximately 100 students, and is actively seeking AACSB accreditation. Emphasis is on teaching excellence, academic scholarship and service to the community. Resume or inquiries to Dr. Arthur C. Joy, Department of Financial Information Systems, Abbott Turner College of Business, Columbus State University, Columbus, GA, 31907-5645. Phone: (706) 562-1659, fax: (706) 568-2184, email: joy arthur@colstate.edu. CSU is an AA/EEO employer.

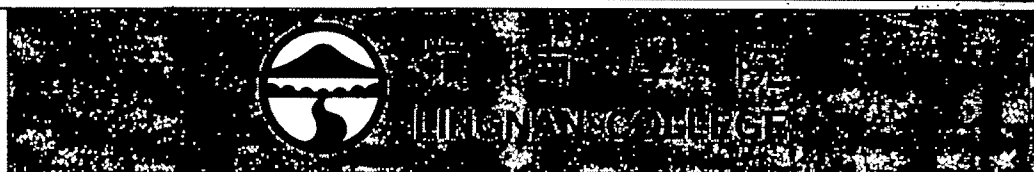
- 436 AUBURN UNIVERSITY MONTGOMERY invites applications for the position of Head of the Department of Accounting and Lowder-Weil Chair at the rank of Associate or Full Professor and an accounting faculty position at the rank of Assistant or Associate Professor for the 1999-2000 academic year with an earlier appointment a possibility. Preference will be given to individuals holding an earned doctorate in accounting from an AACSB accredited University, and who demonstrate the ability to provide quality teaching, research and service. Compensation will be competitive, based on an individual's qualifications and experience. The School of Business is accredited by the AACSB at both the graduate and undergraduate levels. Applications will be reviewed as received and will be accepted until the position is filled. Send letters of interest, vita and names and addresses of three references to Dr. David Sollars, Assistant Dean, School of Business, Auburn University Montgomery, PO Box 244023, Montgomery, AL 36124-4023. Auburn University Montgomery is an EEO/AA Employer.
- 437 UNIVERSITY OF ARKANSAS, Department of Accounting, seeks applicants dedicated to excellence in teaching and research for a tenure-track position at the Associate or Full Professor ranks for Fall 1999. Primary teaching and research interests should be in Financial Accounting or Auditing. Applicants must have a record of accomplishment in both research and graduate level teaching and the ability to supervise doctoral students. Minorities and women are strongly encouraged to apply. Applicants should submit vita and supporting material to: Dr. G. William Glezen, Chair, Faculty Recruiting Committee, Department of Accounting, College of Business Administration, University of Arkansas, Fayetteville, AR 72701. Phone: (501) 575-6126). The University of Arkansas, Fayetteville is an Equal Opportunity Employer.
- 438 UNIVERSITY OF UTAH School of Accounting expects a position for an Assistant Professor, pending funding, for the 1999-2000 academic year. Applicants should possess a Ph.D., D.B.A. or be close to completion. All applicants are expected to have a commitment to research and teaching excellence. Salaries, research support, and teaching loads are competitive and fringe benefits are excellent. The School of Accounting and the David Eccles School of Business are both AACSB accredited at the undergraduate and graduate levels. Bachelor's, M.B.A., M.Pr.A., and Ph.D. programs are offered. The application deadline is February 1, 1999, or until the position is filled. Please send application including proposal or working paper, vita and three letters of reference to Martha Eining, Director, School of Accounting, 1645 E. Campus Center Dr., University of Utah, Salt Lake City, UT 84112. The University of Utah is an EO/AA Employer and encourages applications from women and minorities and provides reasonable accommodations to known disabilities of employees.
- 439 THE UNIVERSITY OF AKRON's George W. Daverio School of Accountancy invites applications for a position as Assistant Professor of Accounting, with a primary teaching area in International/Financial Accounting. The School offers a B.S. in Accounting, an M.B.A. with a concentration in Accounting, a Master of Taxation and a joint JD/Master of Taxation. Applicants should have excellent teaching skills, demonstrated capacity to conduct publishable research, and willingness and ability to work with the professional community. Acceptable credentials include an earned Doctorate in Accounting (credential in hand by August 1999) with a concentration in international accounting; professional experience and certification are desirable. Interested candidates should respond by November 16, 1998. Send your resume and a list of references to Professor Alvin Lieberman, Search Committee Chair, G.W. Daverio School of Accountancy, The University of Akron, Akron, OH 44325-4802. The University of Akron is an Equal Education and Employment Institution.

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- 440 YORK UNIVERSITY, Schulich School of Business, Toronto is seeking tenure-stream faculty in accounting, at the Assistant, Associate or Full Professor level, for July 1, 1999. Preferred candidates will be qualified to teach in Financial or Managerial Accounting. Expertise teaching international accounting would be beneficial. Candidates must possess a completed doctorate or be close to completion, provide evidence of effective teaching, have a commitment to scholarly research and publication, and be willing to use cases in teaching. Salary and benefits are competitive. This position is subject to budgetary approval. York University has a policy of employment equity, including affirmative action for women faculty. Please send curriculum vita to Professor L. S. Rosen, Schulich School of Business, York University, North York, Ontario, CANADA, M3J 1P3.
- 441 OKLAHOMA STATE UNIVERSITY, School of Accounting invites applicants for a tenure-track position at the Assistant Professor rank in the Accounting Information Systems area. The appointment will be effective Fall 1999. Candidates should possess the Ph.D. or equivalent or expect completion by December 1999, strong quantitative research tools and an interest in research and writing, and be an effective classroom teacher. Professional certification is desirable. The application deadline is February 1, 1999, or until the position is filled. Interested applicants should send resumes and names of references to Lanny G. Chasteen, School of Accounting, College of Business Administration, 401 Business Building, Oklahoma State University, Stillwater, OK 74078-4017. Oklahoma State University is an Equal Employment Opportunity/Affirmative Action Employer.
- 442 UNIVERSITY OF MINNESOTA, Curtis L. Carlson School of Management, Department of Accounting is seeking applications for one full time, tenure-track faculty position at the Assistant Professor or untenured Associate level. Applicants must either have an earned doctorate or be in an advanced stage of doctoral work. If degree is not in hand by the starting date for the appointment, individual will be appointed as a Teaching Specialist. All applicants must have a strong commitment to accounting research and teaching. Responsibilities of the position include teaching (undergraduate, M.B.A., and doctoral levels), research and service. Applications should include a curriculum vita, samples of scholarly work and at least two letters of recommendation from faculty who are familiar with their research. Send all materials to Professor Arijit Mukherji, Chair, Search Committee, Department of Accounting, Curtis L. Carlson School of Management, University of Minnesota, 321-19th Avenue South Minneapolis, MN 55455. The deadline for the receipt of materials is October 19, 1998. The University of Minnesota is an Equal Opportunity Educator and Employer.
- 443 WICHITA STATE UNIVERSITY invites applications/nominations for the Heskett Professorship in Accountancy. Appointments at Associate or Professor rank possible. The Heskett Professor is expected to fulfill leadership and mentoring roles in helping build academic quality in the WSU School of Accountancy. Excellence in teaching and research, and active interaction with professional constituencies, required. All accounting specialties considered (individual with primary/secondary interests in Auditing or Systems preferred). Required: (1) Ph.D. or D.B.A.; and (2) a distinguished record of scholarly research (Professor), or a research record demonstrating high quality potential (Associate). Certification and professional experience preferred. Formal review of performance at three-year intervals. Very competitive salary. Deadline for nominations/applications: December 1, 1998. Business programs AACSB accredited. WSU is an AA/EO employer. Send nominations/resume to Dr. Douglas Sharp, Director, School of Accountancy, Wichita State University, 1845 Fairmount, Wichita, KS 67260-0087. Email: sharp@twsumv.uc.twsu.edu, fax: (316) 978-3660.
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- 444 BENTLEY COLLEGE invites applications for a Trustee Professor. We anticipate that applicants currently are Assistant or Associate Professors who, if appointed, will enter as an Associate Professor with tenure. The term as Trustee Professor will be for 5 years and renewable. We seek a truly outstanding individual poised to provide leadership in advancing use of information technology in teaching/scholarship. Appointee will teach one course/semester, including cross-functional courses, and will participate extensively in program development. Bentley is located 10 miles west of Boston. Nearly 8,000 students learn in an environment that integrates information technology with a broad business and liberal arts curriculum, preparing for careers in a global economy. For best consideration, apply by November 15, 1998 to Vice President H. Lee Schlorff, Bentley College, 175 Forest Street, Waltham, MA 02452-4705. An EOE building strength through diversity, we welcome applications from under-represented groups. Please visit our web site at: www.bentley.edu.
- 445 CALIFORNIA STATE UNIVERSITY SAN MARCOS invites applications for faculty positions in all specialization's in accounting beginning Fall 1999. Tenured-track appointments are available, with rank open and dependent upon qualifications. A Ph.D. (or ABD with completion of degree requirements prior to appointment) and evidence/promise of strong scholarship and teaching effectiveness are required for all positions. CSUSM, located in the northern San Diego County, is the twentieth campus in the CSU system. To ensure full consideration for appointment, applications must be received by October 15, 1998. Applications will be accepted until positions are filled. All positions are subject to final budget approval. Submit a letter of application, vita, evidence of teaching performance (evaluations, syllabi, etc.), and three letters of recommendation to Faculty Recruiting Committee, Center for Accountancy, College of Business Administration, California State University San Marcos, San Marcos, CA 92096-0001. CSU San Marcos is an Affirmative Action/Title IX Employer <http://www.csusm.edu/IDEO/faculty.htm>.
- 446 SAN FRANCISCO STATE UNIVERSITY has one tenure-track faculty opening in Information Systems. A doctoral degree in Accounting or related field is required. Professional experience or certification is highly desirable. Faculty are expected to engage in instructional and professional activities and research; major emphasis is on teaching effectiveness. Hiring at the rank of Assistant Professor. The College of Business is accredited by the AACSB at both the undergraduate and graduate levels. Send vita with the names and telephone numbers of three references to Chair, Hiring Committee, Department of Accounting, College of Business, San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132. Closing date for applications is February 1, 1999. The College of Business is particularly interested in attracting women, ethnic minorities and persons with disabilities. SFSU is an Affirmative Action Equal Opportunity Employer.
- 447 GEORGIA STATE UNIVERSITY, School of Accountancy will be recruiting for tenure-track and nontenure-track positions. For tenure-track, all levels and interests will be considered, but interests in taxation, managerial, and international are preferred. Tenure-track assistant professor candidates must have a doctorate in Accounting or completed requirements by employment date. Associate Professor and Professor candidates must have a strong record in teaching and scholarly research. Nontenure track positions will be at the Assistant Professor or Instructor level, and a doctorate in accounting is preferred. All positions are contingent on final budget approval by the University. Starting date: Fall 1999. Salaries: Competitive. To apply: Send letter of application and resume, or nominations to Gary M. Winkle, Interim Director, School of Accountancy, Georgia State University, PO Box 4050, Atlanta, GA 30302-4050. Preference given to applications received before December 1, 1998. Georgia State University is an Equal Opportunity Educational Institution and Affirmative Action Employer.

- 448 COLLEGE OF CHARLESTON invites applications for tenure-track position in Accounting starting Fall 1999. Ph.D. in Accounting and professional certification are desirable, but ABD's encouraged to apply. The undergraduate program is AACSB accredited and the M.S. in Accountancy program is currently seeking accreditation. The successful candidate will have a commitment to excellence in teaching, as well as demonstrated research record or research promise. The College of Charleston is a moderate-sized, four year public comprehensive university located in the historic district of Charleston, SC. Salary and rank are commensurate with qualifications and experience. Interested applicants should send letter of interest, vita and references to Dr. Andrew L. Abrams, Department of Accounting, College of Charleston, 66 George Street, Charleston, SC 29424. Review of applications begins September 1, 1998 until position is filled. Also, anyone interested in the position can contact Dr. Robert Rouse at the New Orleans Riverside Hilton during the American Accounting Association Annual Meeting in August.
- 449 UNIVERSITY OF CALIFORNIA AT LOS ANGELES. Applications are invited for positions in Accounting at both the junior and senior levels. Applicants must have a Ph.D. or be a Ph.D. candidate and exhibit outstanding research capabilities. Resumes should be sent to Professor Patricia Hughes, The John E. Anderson Graduate School of Management, Box 951481, UCLA, Los Angeles, CA 90095-1481. Under federal law, the University of California may employ only individuals who are legally authorized to work in the United States as established by providing documents specified in the Immigration Reform and Control Act of 1986. UCLA is an Affirmative Action, Equal Opportunity Employer.
- 450 ACCOUNTANT, EXPORT TRANSACTIONS: Opportunity in Clearwater. Bachelor's degree. Applies principles of accounting to analyze financial information and prepare financial reports for export division of company. Good interpersonal skills. Contact: Ms. Katie Devine, 14881 Evergreen Avenue, Clearwater, FL 33762-3008.
- 451 WASHINGTON UNIVERSITY. The John M. Olin School of Business is seeking faculty in accounting at all levels. The qualifications include a demonstrated interest in and capacity to do research publishable in leading accounting journals and a high level of teaching competence in graduate and undergraduate classes. Candidates should hold a doctorate degree or be very near completion. Salary and faculty support are highly competitive. The Olin School has excellent physical, computing and library facilities. Each application should include a curriculum vita and a copy of the dissertation proposal (or the completed dissertation); more established scholars should include several samples of their scholarship. Send all materials to Dean Stuart I. Greenbaum, John M. Olin School of Business, Washington University, Campus Box 1133, One Brookings Drive, St. Louis, MO 63130-4899. Washington University is an Equal Opportunity/Affirmative Action Employer and welcomes applications from women and minorities.
- 452 JOHN CARROLL UNIVERSITY is seeking applications for an entry-level, tenure-track position available starting August 1999, in the Department of Accountancy. Qualified applicants must have a Ph.D. or be ABD from an accredited school. Professional certification and relevant experience are desired. John Carroll University is a Catholic, Jesuit University with approximately 4,500 students. The Boler School of Business is AACSB-accredited at the undergraduate and M.B.A. levels, with approximately 450 upper-division undergraduate students and approximately 250 M.B.A. students. The Department of Accountancy has AACSB accounting accreditation. The campus is located in a residential suburb of Cleveland. Candidates should send a letter of application with a curriculum vita and the names of three references to Dr. William J. Cenker, Chair, Department of Accountancy, John Carroll University, University Heights, OH 44118. Phone: (216) 397-4393, fax: (216) 397-3063. John Carroll University is an AA/EOE organization and strongly encourages women and traditionally underrepresented minorities to apply.

- 453 SAN JOSE STATE UNIVERSITY invites applications for four tenure-track Accounting positions as Associate or Assistant Professor with emphasis in (1) Financial Accounting, (2) Accounting Information Systems, (3) Cost Management (4) Taxation. Applicants must have a Ph.D. from an accredited AACSB University. Preference will be given to candidates with demonstrated records of teaching excellence, ability to work in a collegial atmosphere as part of a team, excellent communication and interpersonal skills, and the potential to interact effectively with the Silicon Valley business community. Application deadline is February 15, 1999 or until the position is filled. Positions subject to final approval by the University. Applicants submit a resume to: Dr. Joe Mori, Chair, Accounting and Finance Department, San Jose State University, One Washington Square-BT850. San Jose, CA 95192-0066. (408) 924-3461; email: mori_j@cob.sjsu.edu. SJSU is an equal opportunity employer.
- 454 UNIVERSITY OF CONNECTICUT. Anticipated accounting faculty openings at the Assistant level for Fall 1999 at both the Storrs campus and the Stamford campus. Candidates should hold an earned doctorate or be near completion. This position extends the opportunity to teach at the undergraduate, M.S., M.B.A. and Ph.D. levels and engage in research in a supportive environment. The Storrs campus is located in an outstanding rural area, yet is convenient to several major Northeastern cities, including New York and Boston. The new Stamford downtown campus is located very close to New York City. Candidates with previous faculty experience will be considered. Prior business experience and ability to interact with the business community are desirable. Contact Richard F. Kochanek, Accounting Department Head, University of Connecticut, U-Box 41A, 368 Fairfield Road, Storrs, CT 06269-2041. We encourage applications from under-represented groups, including minorities, women and people with disabilities.
- 455 THE UNIVERSITY OF NEW ORLEANS invites applications for an anticipated position for the 1999-2000 academic year. Preference will be given to those with a teaching interest in the Systems, Auditing and Managerial areas at the undergraduate and graduate areas. Rank is at the Assistant Professor level. Candidates must have a Ph.D. with an accounting major (or ABD in the same area with completion of the Ph.D. by the end of 1999). Salary is negotiable and competitive. The University offers the M.S. in Accounting and the M.S. in Accounting (Tax Option) degree, as well as the M.B.A. Approximately 550 undergraduate accounting majors are enrolled. The Department has separate AACSB accounting accreditation at both the graduate and undergraduate levels. Candidates should send a resume to Professor Philip J. Harmelink, Chairman, Department of Accounting, College of Business Administration, University of New Orleans, New Orleans, LA 70148. The University of New Orleans is a member of the Louisiana State University System and an Affirmative Action, Equal Opportunity Employer.



Lingnan College is a government-funded institution of tertiary education which offers honours bachelor degrees and postgraduate research programmes to Masters level in its Faculties of Arts, Business and Social Sciences. The College is developing as an internationally recognised Liberal Arts University.

Applications are invited for the following posts which will be tenable from 1 September 1999 :

Chair Professor of Accounting

(Ref: 99/AR/ACCT/CP)

Department of Accounting and Finance

Applicants should have a PhD/DBA in Accounting or Finance. Preference will be given to those whose expertise can support quality teaching and research in both accounting and finance. However, candidates committed to teaching excellence with a strong research record in a specialized area of accounting are also encouraged to apply. Applicants should also have substantial research and teaching experience as a Professor with an international reputation for publication and scholarly activities, and administrative experience at senior academic level.

Assistant / Associate Professor (Scale B)

(Ref : 99/AR/ACCT/AP)

Department of Accounting and Finance

Applicants should have a PhD (or nearing completion). The appointee should be able to teach in at least one of the following areas: Financial Accounting, Auditing and Taxation; and is expected to have a strong commitment to teaching excellence, quality research and services to the Department and the College.

Remuneration Package:

(1) Salary Range [under review] (exchange rate : US\$1 = HK\$7.75)

Chair Professor	:	HK\$1,159,380	per annum (minimum)	
Associate Professor (Scale B)	:	HK\$698,520	- HK\$768,600	BAR
		HK\$803,700	- HK\$873,360	per annum
Assistant Professor	:	HK\$522,780	- HK\$628,320	BAR
		HK\$663,420	- HK\$768,600	BAR
		HK\$803,700	- HK\$873,360	per annum

(2) Fringe Benefits

Benefits include passage and baggage allowance, gratuity, medical and dental schemes, annual leave, education allowance for dependent children, and housing for appointees drawing an annual salary of HK\$557,760 (≈US\$72,000) and above. At current rates, salaries tax will not exceed 15% of gross income.

Application Procedure:

Applicants are invited to submit (1) a detailed curriculum vitae, and the names, addresses, fax numbers and email addresses (if available) of three referees; or (2) an application form which is obtainable from the College's Homepage at <http://www.ln.edu.hk> to the College Secretariat (Personnel), Lingnan College, Tuen Mun, Hong Kong by post, or by fax (852)-2891-5782, or by email : recruit@ln.edu.hk. Applications will be considered until positions are filled. The reference number of the post should be quoted on all correspondence.

The College reserves the right not to fill the posts or to fill the posts by invitation or by search.



香港中文大學
THE CHINESE UNIVERSITY OF HONG KONG



Faculty Positions in the School of Accountancy

As a comprehensive university, The Chinese University of Hong Kong offers programmes up to PhD level in the Humanities, Business Administration, Education, Engineering, Medicine, Science and Social Science (including Architecture). The University has a large and scenic campus in the region (over 134 hectares), occupying a hillside in the New Territories facing Tolo Harbour. The University is very active in promoting research and consultancies and in liaising with the industrial and business sectors worldwide.

The School of Accountancy is one of six academic departments in the Faculty of Business Administration. All six departments have established outstanding academic reputation, and in recent surveys, the MBA programme at The Chinese University has been consistently rated among the top in Asia. As a pioneer and leader in accounting education in Hong Kong and Asia since 1963, the School has established an excellent reputation for professional education and research. We offer BBA, MAcc, MPhil and PhD degrees in accountancy. Our business and accounting programmes are very much sought-after in Hong Kong. Our 560 accounting major students are of first class calibre and our over 2,500 accounting graduates consistently shine professionally in the Asia Pacific region. The conversion to a professional school in 1993 further consolidated our efforts and propelled CUHK's accounting programmes into international prominence.

To further enhance our role as an international center for excellent accounting education and research, established and promising accounting scholars in all fields of accounting around the world are invited to join our strong and devoted faculty team. The School currently has 24 full-time and several visiting academic staff. Applications are now invited for the posts of Lecturer (carrying the academic title of Assistant Professor or Associate Professor, as appropriate) or Senior Lecturer (carrying the academic title of Associate Professor or Professor, as appropriate). Applicants should have a PhD (or nearing completion). An accounting professional qualification or other relevant certification is desirable but not necessary. Candidates must be willing to teach at undergraduate and postgraduate levels, as well as day-time and evening classes. Commitment to teaching excellence, quality scholarly research and School/University service is required. The medium of instruction is English and/or Chinese. Full-time and part-time Teaching Assistants are employed to assist teachers in teaching and research activities.

The range of annual salary (12 months) is approximately from US\$67,000 to \$112,000 for appointment at the grade of Lecturer and from US\$104,100 to \$139,900 at the grade of Senior Lecturer. The quoted amounts are currently under review for cost-of-living adjustment, which is usually considered at yearly intervals. Starting salary and grade will be commensurate with qualifications and experience. Benefits include leave with full pay, medical and dental care, education allowance for children and housing benefits (teaching staff at the grade of Senior Lecturer or above will, subject to availability, be offered on-campus accommodation). Appointment will initially be made on fixed-term contract basis for up to three years and will carry a contract-end gratuity (up to 15% of basic salary) where appropriate.

Applications with full resume in duplicate and names and addresses (fax numbers/e-mail addresses as well where available) of three referees should be addressed to Professor Simon S.M. Ho, Director, School of Accountancy, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong. Please quote the reference number 98/066(020)/2 and mark "*Recruitment - Confidential*" on cover. Details about the University and the School can be found in our Web site: <http://www.cuhk.edu.hk/acy>. For additional information please fax (number 852-2603-6604) or e-mail <simon@baf.msmail.cuhk.edu.hk> to the School of Accountancy. Applications will be accepted until positions are filled.



The Hong Kong Polytechnic University Department of Accountancy

Position Openings—Assistant, Associate, or Full Professor

Candidates must have a PhD in hand (or be near completion), evidence of teaching ability and a strong research track record/potential. Practical professional experience and professional designation will be an advantage. Although we have stronger needs in the financial and managerial areas, other expertise will be considered for candidates with outstanding credentials. Faculty members are free to pursue any areas of research, but those interested in applying rigorous research paradigms to China-related research issues will find the Department's network and resources particularly helpful. In the year past, members in our department published in such places as *JAE*, *CAR*, *JFQA*, *AH*, *JAAF*, *JBFA*. **Visiting positions** are also available for individuals who can make a contribution toward improving the quality and quantity of our research output. Please direct all inquiries to Joseph Cheung by email [acjoe@inet.polyu.edu.hk], phone [(852) 2766-7046], fax [(852) 2365-9303], or post [Department of Accountancy, The Hong Kong Polytechnic University, Hung Hom, Hong Kong]. For further information about us, please visit our web site [<http://www.polyu.edu.hk/acct/>].



University of Alabama Faculty Position in Accounting/Information Systems

The Culverhouse School of Accountancy, College of Commerce and Business Administration seeks applications for two positions. The first position will be for an associate or full professor and the second will be for an assistant professor. Anticipated starting date is Fall 1999. Both positions require an earned doctorate (candidates near completion will be considered for the assistant professor position). The senior position requires the ability to teach and conduct research in the area of information systems and a willingness to work with doctoral students. The assistant position requires the ability to teach information systems and to conduct research in information systems or related areas. Review of applications will begin October 1, 1998 and will continue until the positions are filled. Applications should include a vita, a list of references, and evidence of scholarly work (the dissertation proposal is acceptable for candidates with the degree in process). Positions are subject to funding. Applications should be sent to: **Professor Thomas P. Howard**, Culverhouse School of Accountancy, The University of Alabama, Box 870220, Tuscaloosa, AL 35487-0220.

The University of Alabama is an affirmative action/equal opportunity employer and encourages and welcomes applications from women and minorities.



Dean of the Seidman School of Business

Opportunity. Right Here.

The dean of the Seidman School of Business will have the vision and skills to take the School to a new level of excellence. The new dean will use interpersonal and motivational skills, energy, and creativity to provide collaborative leadership with the School's faculty and area business leaders.

Grand Valley State University

We Mean Business.

- The fastest growing university in Michigan — currently 16,000 students
- Supported by an active endowment
- AACSB accredited, 50 faculty
- New \$55 million facility

Committed to Excellence.

- Our mission: Excellence in teaching enhanced by active scholarship
- Advisory board of key area business leaders
- Close ties with world-class companies

Grand Rapids, Michigan

A City that Really Works.

- Michigan's second largest city
- West Michigan's economic, educational, and cultural center
- Ranked among the "Best Cities for Business" by *Fortune Magazine*
- Ranked 15th out of 310 metropolitan areas by *Industry Week* in its first World-Class Communities survey, published in 1997.
- Home to four manufacturers listed among "The Best 100 Companies to Work For in America."

A Great Place to Live.

- Excellent housing opportunities near top-rated schools
- Neighborhoods are clean, safe, green, and friendly
- Close to Lake Michigan beaches and recreation areas
- More than 20 lakes, 60 parks, and 30 golf courses
- Easy access to Chicago, Detroit, and Toronto

Check our website at www.gvsu.edu/ssb/ssb-dean/ for more information about GVSU and the selection criteria for this position. Compensation is competitive. Candidates should submit a resume with five references to:

GRAND VALLEY STATE UNIVERSITY

Seidman Dean Search Committee
Office of the Provost
Grand Valley State University
Allendale, Michigan 49401
www.gvsu.edu



香港浸會大學
HONG KONG BAPTIST UNIVERSITY

School of Business
Associate Professor/Assistant Professor (PR001/99V)

The School of Business comprises five academic departments, viz Accountancy and Law, Economics, Finance and Decision Sciences, Management and Marketing. It currently provides the following five programmes of study:

- Bachelor of Business Administration (Honours) with seven options in Accounting, Applied Economics, China Business Studies, Finance, Human Resources Management, Information Systems Management and Marketing
- Bachelor of Social Sciences in China Studies (Honours), Economics Option
- Master of Business Administration
- Master of Philosophy
- Doctor of Philosophy

The School of Business is inviting applications for regular positions at the **Associate Professor/Assistant Professor** level in **Financial Accounting or Management Accounting** tenable September 1999.

Applicants should have a Ph.D. degree or equivalent professional standing. A record of excellence in teaching at the tertiary level, and strong research background and leadership ability are expected for an appointment to senior rank. Knowledge of the Asia-Pacific region and Hong Kong, and professional experience in industry and consultancy are desirable. The successful candidate will be responsible for teaching and supervising research projects at both the undergraduate and postgraduate levels. A visiting appointment for a shorter duration may also be considered.

Salary Scales at 1997/98 price level: (approximately US\$1 = HK\$7.74)

Associate Professor : HK\$67,685 - \$90,925 p.m. by 8 increments (Scale A)
HK\$58,210 - \$72,780 p.m. by 5 increments (Scale B)
Assistant Professor : HK\$43,565 - \$72,780 p.m. by 10 increments
(Entry salary will commensurate with qualifications & experience)

Terms of Appointment:

The appointee will initially be offered a fixed-term contract of three years with gratuity of 15% of basic salary payable upon satisfactory completion of the contract. Subject to performance review and mutual agreement, the appointee may be offered re-appointment on another fixed-term gratuity-bearing contract or on superannuable terms. Benefits include annual leave, medical & dental benefits for the appointee & family, children's education allowance, housing and passages where applicable.

Application Procedure:

Applications, together with updated curriculum vitae, copies of transcripts, testimonials and names, fax numbers, email/correspondence addresses of three referees should reach the Personnel Office, Hong Kong Baptist University, Kowloon Tong, Hong Kong [Fax: (852) 2339-5001; E-mail: recruit@hkbu.edu.hk]. Applicants are requested to send in samples of publications, preferably three best ones out of their most recent publications. Applicants should also request their referees to send in confidential reference to the Personnel Office direct. *Please quote PR number on the applications, confidential reference letters and any subsequent correspondence.*

Closing Date: 31 October 1998 (but the search process will continue until the position is filled)

The University reserves the right not to make an appointment for the posts advertised, and the appointment will be made according to the terms & conditions then applicable at the time of offer.

General information about the University is available at the World Wide Web home page <http://www.hkbu.edu.hk>



As the oldest tertiary education institution in Hong Kong, the University of Hong Kong has attained unparalleled achievements since 1911 in Hong Kong and the region by drawing on the great cultural traditions of China and the West. The University is a major research institution with nine faculties and 100+ departments and sub-divisions of studies and learning, and a full- and part-time postgraduate and undergraduate student body of almost 15,000, including 4,000 postgraduate students. Our firm commitment to research excellence and internationalisation has established us as one of the top universities in the Region. We are committed to our vision of globalisation and enhancing our research excellence.

Associate Professor/Assistant Professor in the School of Business

Applications are invited for appointment as Associate Professor/Assistant Professor (several posts - Ref: RF-97/98-92) in all fields, such as Accounting, Finance, Management Information System, Human Resource Management, Management of Organisations, Marketing, and business areas in the School of Business, tenable from as soon as possible. Appointments will initially be made on a three-year fixed-term basis, with a possibility of renewal.

The School of Business was established as a new integrated structure in 1995 and is fast expanding. It is the School's mission to become one of the best business schools in Asia.

Applicants should have a PhD degree, be able to demonstrate potential for research excellence, and have a successful record of research and teaching. The appointees are expected to strengthen research activities and supervise doctoral students. For appointment as Assistant Professor, scholars must possess strong and demonstrated research potential plus good teaching skills. Established scholars with top tier publications and good teaching will be considered for appointment as Associate Professor. Applicants should indicate clearly the field and level they wish to be considered for.

Applicants who have responded to the last advertisement in 1997 (Ref.: RF-96/97-67) need not re-apply.

Annual salaries [attracting 15% (taxable) terminal gratuity] are on the following scales, with starting salary depending on qualification and experience: Associate Professor: HK\$812,220 - HK\$1,091,100 (9 points - in the grade of Senior Lecturer) (approx. US\$100,736 - US\$135,326); Assistant Professor: HK\$522,780 - HK\$873,360 (11 points - in the grade of Lecturer)* (approx. US\$64,848 - US\$108,320) (US dollar equivalents as at 19 June 1998). * An appointee with an annual salary at HK\$698,520 (approx. US\$86,640) or above may be considered for the award of the title of Associate Professor.

At current rates, salaries tax will not exceed 15% of gross income. The appointments carry leave medical and dental benefits and an allowance for children's education in Hong Kong. In most cases, a financial subsidy for private tenancy may also be provided at a charge of a percentage of salary, currently 7.5%.

Further particulars and application forms can be obtained on WWW at <http://www.hku.hk>; or from the Appointments Unit, Registry, The University of Hong Kong, Hong Kong (Fax (852) 2540 6735 or 2559 2058; E-mail: APPTUNIT@REG.HKU.HK). Closes **15 December 1998**.

*The University is an equal opportunity employer and
is working towards a smoke-free environment*

Announcement of Tenure-Track and Visiting Faculty Positions, Department of Accounting

NYU Stern School of Business invites applications for tenure-track faculty positions at the Assistant Professor level and full-time Visiting positions in accounting commencing fall 1999. All accounting-related discipline areas will be considered. Candidates should have a Ph.D. or be assured of its completion within one year and are expected to be productive researchers and effective teachers at undergraduate, MBA and Ph.D. levels.

Interested candidates should send resumes to Professor Paul R. Brown, New York University, Leonard N. Stern School of Business, 40 West 4th Street, Suite 431, New York, NY 10012.

New York University encourages applications from women and members of minority groups.



Northeastern University

Cowan Research Professor

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Brigham Young University

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Foreword by **C. Torben Thomsen**

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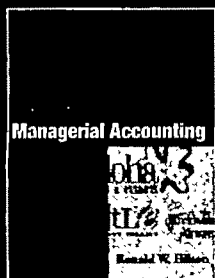
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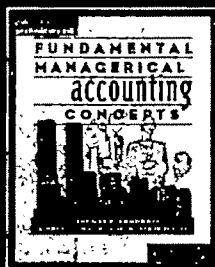
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